HOLLY LETTER

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More People Knowing and Growing More Holly

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A MESSAGE FROM THE PRESIDENT

Dictators castigate, -- leaders cogitate, interrogate, postulate and then motivate.

Did the foregoing agitate or amuse you? Was there any reaction, pro or con? If there was, I have achieved my first goal, getting your attention.

The easiest thing in the world is to castigate someone, especially when your ego has been bruised by a rebuff or by the lack of success of what you deemed a worthy program; but castigation is a two-edged sword unless it is used by a dictator in situations completely under his control. I, alas, am not in that position.

I did cogitate, postulate and then try to motivate, but the response was so poor that it's obvious that I think better than I act. Tired of guessing games? I'm speaking of the Publications for Libraries Project; 30 out of a possible 757 responded. The question is why?

We know that many people do not like to speak publicly, so it was assumed that information concerning holly could, and would, be spread through the donation of the available literature to your nearby library - by you. It was also assumed that having the U.S. government bear at least 20% of the cost as a tax deduction would put a little icing on the cake.

Well, I was wrong, so I am asking why???? In this situation, you are the dictators and can successfully castigate me; so chew away, write me nasty letters, tell me why the idea had no appeal, tell me what it was that turned you off. When you get mad enough, take a moment to show me how you would have done it, and then order the material and get it to your local library. This donation can be filed under "Horticulture", "Holly", "Forestry", or "Landscaping" (you might take an order blank along and have the library acquire several additional copies!).

Don't forget that I expect a veritable barrage of complaints and/or orders. Anything is better than being ignored. The other 30 can adjust your halos -- you're beautiful.

NEW TRUSTEES - SOME BACKGROUND INFORMATION

Theodore R. Dudley, 10041 Worrell Ave., Glenn Dale, Md. 20769

Ted grew up in Falmouth, Massachusetts, and had the best possible introduction to holly under the tutelage of Wilfrid Wheeler, Sr. He received his B.S. at the University of Massachusetts, and after the Master's Program at Cornell University went to the University of Edinburgh, Scotland for his PhD. in botany.

From 1963 to 1966 he was Horticultural Taxonomist at the Arnold Arboretum; since that time he has been Research Botanist at the U.S. National Arboretum. He has travelled extensively, making plant collections in Turkey, the Peruvian Andes, Tierra del Fuego, and, most recently, in the southeastern U.S. with Gene Eisenbeiss, searching for native *Ilex* species.

An honorary life member of the HSA, Ted brings a great interest in, and knowledge of, hollies to his position as trustee.

William N. Kuhl, 9010 Satyr Hill Rd., Baltimore, Md. 21234

Bill was born in 1943 in Auburn, New York. His first horticultural experience came during several summers' work at his uncle's nursery in upstate New York, where he had the opportunity to learn sound horticultural practices. In 1966 he graduated from the State University of New York, College of Forestry (Syracuse), with a Bachelor of Landscape Architecture degree.

At that time he came to Maryland to work as a landscape architect for the State Highway Administration. This work was interrupted by an army tour of duty in Viet Nam, but after leaving the service he returned to Maryland. In addition to his job with the State, he began to assist Mrs. Helen McLean with her nursery, following her husband's death in 1971. In 1972 he purchased the nursery (McLean Nurseries), and has been operating it ever since, a rewarding and stimulating experience. Mrs. McLean, a Holly Society member also, has been active in helping with the nursery, especially at Christmas when she works on the wreaths.

Those of you who were at the 1978 Annual Meeting will remember that Bill won a large number of awards in the Holly Sprig contest, evidence that he is bringing considerable expertise to his position as trustee.

Virginia Morrell, 300 W. Cornet Bay Rd., Oak Harbor, Washington 98277.

Virginia, our new trustee from the Far West, received a Bachelor's degree from Whitman College, and has been active in numerous horticultural activities ever since. Co-owner of the Morrell Holly Farm from 1956-76, she also has been active in the Oregon Holly Growers and the HSA for many years (this includes being President and charter member of the Pacific Northwest Chapter from 1973-1977). Like the other trustees of the HSA her interests in plants range widely, and she brings a broad base of knowledge to her new post.

WILFRID WHEELER'S PRESENTATION

Interest was expressed by some of those present at the Annual Meeting of the HSA in Falmouth about the background of my father, Wilfrid Wheeler, and the founding of Ashumet. The following is a summary of what I said in a short talk at that gathering.

Members of our family were among the early settlers who came to Concord, Massachusetts, in 1640. They, in common with many others of that period, were looking for tillable land. They found it, but it required a lot of labor to make it useable. The Wheeler family has been in Concord ever since, and the old Wheeler house is now owned by my son.

Dad was brought up on a typical farm of the period, and learned much about agriculture the hard way. There were 4 brothers and a sister in the family, all of whom worked to help produce the crops. It is interesting to know that all of the children were sent through college and given a trip to Europe; quite an accomplishment in those days.

Later, Dad had a farm and greenhouses of his own. He be-

came more and more interested in agriculture, joined many of the farm groups and organizations, and became the first Commissioner of Agriculture for the State. He served in this post for eight years, but was not re-appointed when Calvin Coolidge became Governor.

This, in my opinion, was actually a blessing in disguise. About that time Mr. Charles R. Crane of the Crane plumbing family wanted to show Eastern farmers that large tracts of land could be profitably operated here. Crane engaged my father to operate Coonamessett Ranch. It was located in Hatchville (a section of Falmouth) and contained 15,000 acres. It was supposed to be the biggest spread east of the Mississippi. Hollies were abundant in the area, and undoubtedly Dad became interested in them at that time.

In 1925 the Crane family decided to end their experiment. My father had grown to love Cape Cod, and acquired 600 acres of land around the shores of Ashumet Pond in Hatchville. This is where the holly planting started and is now located. He and Joseph Dias, his faithful friend and helpmate, spent the next thirty years in collecting specimens of *Ilex* from the Cape Cod woods and planting them at Ashumet. These trees were selected on the basis of fruit color, leaf shape and color, berry arrangement, tree shape and form, and other factors. The specimens were planted at Ashumet if available and small enough; otherwise cuttings were taken. Hollies were named after various members of the family, including in-laws. No partiality, of course!

Over the years, what was originally a stand of pitch pine grew into what was, and still is, the largest holly collection north of New Jersey. When my father died, the land was sold to Mr. J. K. Lilly, 3rd. He, in turn, gave it to the Massachusetts Audubon Society which still owns it.

Why was all this work and effort put into Ashumet? Dad loved nature, trees, flowers, other plants, and the out-of-doors. He felt very strongly that the fundamental beauties of nature should be protected and preserved, and wanted to do his bit towards this end. Remember too that much of this was done on his own initiative before the word "environment" was popularized. He would be very happy if he knew that he was at least partially successful.

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Editor's Competition#1: The editor is offering a prize of $5.00 to the first HSA member who mails to her the correct answer to the following question: What is the connection between *Ilex* x *altaclarensis* and an Egyptologist involved in the excavation of Tutankhamen's tomb? The winner, and the correct answer, will be given in the next *Holly Letter.* Have fun!

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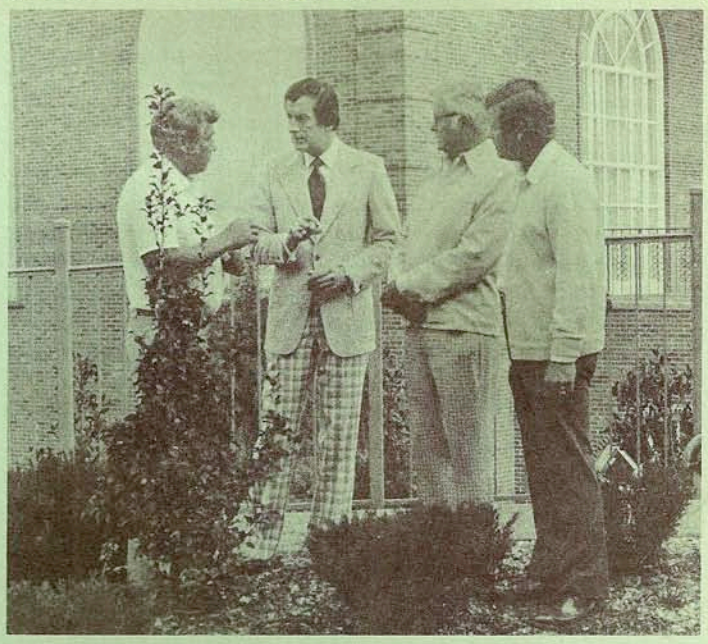
CHAPTER NOTES

1. Gordon E. Jones, Director of Planting Fields Arboretum, reports that the Long Island Chapter of the HSA has been reactivated. The new President is Wilson (Bill) V. Mott, of Huntington, N.Y. Together with the other new officers he is heading up what promises to be a very energetic chapter. We look forward to hearing from them about their activities.
2. Mary McDaniel reports that the Great Rivers Chapter met for its 14th Annual Meeting in the Opryland Hotel, Nashville, Tennessee, on November 10th, 1978. Activities included several very interesting speakers, among them President Jim Merchant; tours of Opryland Park, the Tennessee Botanical Garden at Cheekwood, and the Hermitage; a business meeting; and an exciting auction to end the session on the evening of November 11th.

This chapter will be the host of the 1979 National Annual Meeting in St. Louis, and it sounds like we shall be in good hands!



Holly Presentation ('Cave Hill #1') to the Opryland Hotel. Left to right - Jim Merchant (grower of this particular plant); Jack Vaughn, manager of the hotel; Theodore Klein, introducer of this cultivar; and Ben Moore, Opryland horticulturist.

SOME ECOLOGICAL OBSERVATIONS ON AN *ILEX* FOREST, SANDY HOOK, NEW JERSEY

Richard Stalter

St. John's University

INTRODUCTION

Sandy Hook is a 10 kilometer long peninsula varying in width from 100 meters to 1.5 kilometers. Located 25 kilometers due south of Manhattan and 24 kilometers east southeast of Perth Amboy, the Hook is attached to the mainland of New Jersey just south of the Atlantic Highlands.

The "Hook", comprising 818 hectares, is a complex and compound recurved barrier spit formed from the northerly transport of beach material derived from the erosion of beaches extending approximately 40 kilometers south (Nordstrom et al. 1975). The growth patterns of Sandy Hook since the late 1600's have been well documented (Bache 1845, Chrysler 1930, Nordstrom et al. 1975). As Sandy Hook has grown at its northern end, new "hooks" were formed, leaving old ones behind. Examples of this pattern of growth may be found by examining Spermaceti Cove and Horseshoe Cove.

Sandy Hook has been protected by the United States Government since 1893 when Fort Hancock was constructed at its northern end. On November 27, 1972, a park was established at Sandy Hook by an act of Congress and was administered by the National Park Service as a unit of the Gateway National Recreation area. Little change has taken place on the Hook as compared to the rapid development of beach and upland property in surrounding Monmouth County, and parts of the park have retained characteristics of a remote wilderness (Mekenian 1968).

Within Sandy Hook exist approximately 30 hectares of holly forest which are among the best developed on the east coast of the United States.

Other areas where *Ilex opaca* is significant are Fire Island National Seashore, Suffolk County, New York (Art et al. 1974) and the Lowell Holly Reservation, Mashpee, Massachusetts. The Lowell Holly Reservation, owned by the Commonwealth of Mass-

achusetts Trustees of Reservations, is a 140 plus acre tract dominated by *Ilex*. Within this tract are "well over 500 trees from 6-50 plus feet tall" (Dudley 1978, personal communication). Gruver (1969) has compliled a list of "big hollies" from Texas to Long Island. The tallest (but probably not the oldest holly) may be one described by Gaddy (1977) in the Congaree Swamp, Richland County, South Carolina, that had a circumference of 8'2", a height of 99', and a canopy spread of 40'. Dudley (personal communication) contends that there are "probably no more than 100 trees in the 70 feet 24 inch DBH size range" in the United States, since most of the larger hollies were cut for special lumber purposes soon after the country was settled.

The Hook was studied previously by Chrysler (1930) who conducted a vegetation survey and divided the area into five broad vegetation units: salt marsh, middle beach, upper beach and young dune, *Myrica* thicket and *Acer-Ilex* forest. While Chrysler recognized the importance of holly, no quantitative data were gathered nor did Chrysler treat the areas where holly dominated as a distinct unit. The only botanical work prior to 1930 was that of Britton who collected 30 specimens at Sandy Hook and deposited his materials at the herbarium at Rutgers University, New Brunswick, New Jersey. Mekenian (1968) recognized the importance of holly but did not prepare any quantitative data to determine its importance or dominance. Mekenian's excellent thesis covering four years of observation included a species list of the area, historical information, and copious data on holly leaf morphology.

The objective of the present study was to sample the arborescent vegetation of the holly forest and compare the data with previous studies conducted in holly or maritime forests by the author at Fire Island, New York, Montauk, New York, and Bull Island, South Carolina.

Methods

The arborescent vegetation was sampled by the Point Centered Quarter Method during September and October, 1977. Only trees with a DBH greater than 9 cm were sampled. Twenty-five points spaced 10 meters apart were chosen. The results are given in Table I. The ages of the largest trees were provided by Matt Kandolf, an undergraduate student at Princeton University, who dated the trees as part of a senior research project.

Results

Data from the Point Centered Quarter Method (Table 1) indicate that *Ilex opaca* is the dominant species (Importance Value 268) of the Bayside Holly Forest. *Ilex* is represented in all size classes (Table 2). Most hollies are greater than 15 cm in diameter.

The hollies of Sandy Hook are taller than those of Sunken Forest, Fire Island, New York, and are also larger in circumference (Table 3). The oldest tree at Sandy Hook was 144 years old, and had a DBH of 62 cm. On Fire Island, New York, where climatic conditions are similar, a core removed from a holly under 38 cm. DBH was 164 years old (Bullington 1976, personal communication). The hollies with the largest DBH on Fire Island are older (but not as large with respect to DBH) or as tall as those on Sandy Hook.

Discussion

Studies in forest where holly is dominant, or an important associate, have been conducted at Montauk by Greller (1976, personal communication), at Fire Island (Schulte 1965, Art et al. 1974, Stalter 1975) and Bull Island, South Carolina (Stalter 1974). A comparison of Importance Values indicates that holly is dominant on Sandy Hook and Fire Island, an important associate at Montauk, (following *Quercus velutina* Lam.) and an associate in the maritime forest of Bull Island, South Carolina (Table 3). However, the high relative dominance values and large basal area values reveal the unique status of the holly forest at Sandy Hook (Table 1).

Both Mekenian (1968) and Chrysler (1930) have considered community development on Sandy Hook that partially explains the kind of vegetation found in this area, its sources, methods of dispersal, and the uniqueness of holly. The portion of the Hook just south of the Bayside Holly Forest where the study was conducted is a narrow sandy neck of land that stretches for five kilometers averaging no more than 150 meters in width. Chrysler (1930) contends that this narrow stretch of land never bore "arboreous growth" and data from Nordstrom et al. (1975) since the 1700's support Chrysler's contention. At times this "neck" has been breached by storms, the most recent being in 1962. This neck of land has served as an effective barrier preventing migration of the oaks and mesic arborescent species from nearby Atlantic highlands.

Most of the woody species that one finds on Sandy Hook - *Ilex opaca* Ait., *Celtis occidentalis* L., *Prunus serotina* Ehrh., *Amelanchier canadensis* (L.) Medic., *Parthenocissus quinquefolia* (L.) Planch., and *Rhus radicans* L. - have been brought to the Hook by birds.

Martin (1959) studied the vegetation at nearby Island Beach State Park and tested fifty species' tolerance to salt spray. *Ilex opaca* and *Juniperus virginiana* L. had a very high resistance to salt spray while *Prunus serotina* and *Amelanchier canadensis,* two plant associates at Sandy Hook, suffered injury and burning after salt spray treatments were discontinued. *Ilex* is quite resistant to salt spray and may tolerate salt spray better than its associates in the Bayside Holly Forest at Sandy Hook. *Juniperus virginiana,* while resistant to salt spray (Martin 1959), cannot reproduce in shade (Bard 1952), and thus cannot compete with holly where mature holly trees provide dense shade.

Mekenian (1968) observed copious seedling development of *Prunus serotina* over a four year period. While many small seedlings were observed, there were few saplings or large trees present and no trees as large as the largest hollies (Tables 2 and 4). *Amelanchier canadensis,* a sub-canopy species, is attacked by cedar rust (Mekenian 1968) and this, coupled with its sensitivity to salt spray (Martin 1959), may prevent this species from successfully competing with holly.

During the late 19th century and early part of the 20th century, many of the branches of female holly trees on Sandy Hook were cut at Christmas time. Some enterprising entrepeneurs decapitated trees for the choice red berries (Mekenian 1968). Even with this unnatural selection, holly at Sandy Hook today is dominant. It is quite probable that holly will maintain its dominance at the Hook for many years because of its isolation with respect to mesophytic tree species, lack of competition, shade tolerance, and tolerance of salt spray.

TABLE 1. Density, relative density, frequency, relative frequency, basal area, relative dominance, and importance values for trees of the *Ilex* forest, Sandy Hook, New Jersey.

Species	D	RD	F	RF	BA	RD	IV
Ilex opaca	3.72	93	100	78	6385	97	268
Prunus serotina	.20	5	20	16	151	2	23
Juniperus virginiana	.04	1	4	3	38	1	5
Amelanchier canadensis	.04	1	4	3	32	1	4

TABLE 2. Distribution of trees in 4 size classes (expressed as a percent) of the *Ilex* forest, Sandy Hook, New Jersey.

Species	0 - 8.9	9.0 - 15	15.1 - 25.4	25.4
Ilex opaca	8	22	37	34
Prunus serotina	33	67	–	–
Amelanchier canadensis	50	50	–	–
Juniperus virginiana	–	–	–	100

TABLE 3. A comparison of the basal areas of *Ilex opaca* in 4 maritime forests.

Study Area	Basal Area (Inches)
Sandy Hook, New Jersey	6094.13
Sunken Forest, New York	3445.0
Bull Island, South Carolina	1687.0
Montauk, New York	472.9

TABLE 4. Density and relative density of tree seedlings occupying 20 (2 x 4 m) quadrats in the Bayside holly forest.

Species	Density (Trees/hectare)	Relative Density (%)
Prunus serotina	2,250	65
Ilex opaca	652	19
Amelanchier canadensis	500	14
Celtis laevigata	63	2

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PLANT PATENTS ADDITION

When the Research and Development Committee of the HSA were compiling the list of *Ilex* plant patents for the last *Proceedings,* they were not aware that 26 patents were missing from the vertical file collection at the National Arboretum, including No. 3517. Accordingly, 'Blue Prince', which is considered by many holly enthusiasts to be one of the finest "Blue Holly" selections was inadvertently omitted from the listing. The Research and Development Committee regret this, and are indebted to Dr. Elwin Orton, Jr., Department of Horticulture, Cook College, Rutgers University, for calling it to our attention.

Plant Patent No.	Species	Cultivar
3517	*Ilex* x *meserveae* issued 12 March, 1974, to Kathleen K. Meserve, St. James, N.Y., assignor to the Conrad-Pyle Co., West Grove, PA.	'Blue Prince'

(T. R. Dudley)

NEW PLANT PATENT ANNOUNCED

The first Plant Patent of 1979 has been announced and published. It is:

Plant Patent No.	Species	Cultivar
4367	*Ilex opaca* issued 16 January 1979 to T. Linwood Steward, Jr. R.F.D., Lambs Rd., N.J. 08071	'Steward's Silver Crown'

'Steward's Silver Crown' was registered by the International Registration Authority of the Holly Society of America, Inc. Registration No. 3-78 and was published in the *Proceedings* of the *55th Meeting of the Holly Society of America, Inc.,* page 17, January 1979.

(T. R. Dudley)

SALT TOLERANCE OF HOLLIES

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The initial interest in studying the salt tolerance of hollies was derived from a comment by Orlando Pride in the *Holly Letter.* He speculated that hollies might exhibit good salt resistance. Gene Eisenbeiss (5) also commented on holly salt tolerance in the July, 1976 issue of the *Holly Letter* and noted that *Ilex opaca* Ait. and *Ilex glabra* (L.) should be salt tolerant since they are native seashore plants. He also mentioned that those plants growing naturally along the seashore might have more resistance than those originating at a considerable distance inland. One of the few critical studies of holly salt tolerance was conduced with *Ilex vomitoria* Ait. (1). This species showed good tolerance to soil-applied salts but aerial tolerance was not determined. Wyman (11, 12) mentioned *Ilex opaca* and *Ilex glabra* as being salt tolerant but in no cases were the plants evaluated under controlled conditions.

Our early studies (2,3,4) have shown that evaluations of plant salt tolerance along the coast or highway are at best superficial. Most of the early evaluations (6,7,8,9,11,12) were based on plant appearance after exposure to hurricanes, storms, or seasonal deicing salt applications. All plants do not respond to salt in the same manner. Plants which are tolerant of aerial salts may not tolerate soil salts and vice versa. Evaluations along the sea coast usually consider only aerial salt tolerance. Certain plants show no perceptible leaf necrosis (burn), tip dieback, or witches broom, but do suffer growth reductions. A control (plant which receives no salt but is growing under the same environmental conditions as the salt-treated plants) is necessary to accurately monitor growth reductions. The fact that various investigators (4) have evaluated the same plant under different environmental conditions has led to incongruous tolerance ratings. For example, *Pinus sylvestris,* Scotch pine, has been given good, moderate and poor ratings. What value is this information and how can a landscape planner effectively choose plants for saline environments based on these ratings?

Evaluations of salt-induced injury should be based on salts, concentrations, methods (aerial versus soil-applied), osmotic effects, appearance, growth parameters, shoot or leaf contents of Cl and, perhaps, Na. The principal oceanic and de-icing salt is sodium chloride (NaCl) and this must serve as the principal salt. To determine specific ion effect (either Na or Cl) a counter ion must be included, such as potassium (K) in KCl or sulfate (SO_4) in $NaSO_4$. Concentration is not as important as originally thought.

Whether the salts are applied at a high or low rate does not make a great difference. Plants treated with high concentrations show earlier symptoms but plants treated with low levels show the same symptoms on a delayed basis. Application methods are important and critical screening must involve both aerial and soil applications. Osmotic effects, although not as important as specific ion effects, must be considered. Appearance and growth parameters provide valid indices as to the effects the salt treatments are having on the plants. Both are necessary because appearance does not accurately reflect the degree of damage. Accumulation of the chloride ion and to a lesser extent the sodium ion relates to the overall pattern of injury. If leaf or shoot Cl is high then injury is significant. Sodium accumulation patterns are erratic and seldom reflect the degree of injury.

It is not known how Cl injures a plant but based on our studies with woody plants it appears that the essence of woody plant salt tolerance is the ability to preclude excessive Cl accumulation. *Ilex vomitoria* leaves contained only 0.2 percent Cl while other plants which exhibited severe leaf tip burn averaged 2.0 percent Cl. Based on the evaluation parameters which were developed from earlier research (2,3,4), a study was undertaken to determine the relative salt tolerance of 19 holly taxa.

Materials and Methods

Cuttings of the hollies (see Table 1) were collected or received from reputable arboreta or other sources in mid to late summer of 1977. After rooting, the plants were placed in a sterilized, 1 soil; 1 peat; 1 perlite medium (pH 5.5) in 11cm (4 1/2") diameter plastic pots. The plants received a 90-day cold treatment (5°C: 41°F) and were brought into the greenhouse. When buds started to break, a 200ppm N solution was applied twice a week until the plants reached suitable size for salinity treatments. The plants were maintained on a 15 hour photoperiod at 24°C (75°F) day and 20°C (68°F) night.

All taxa were treated with 0.15N NaCl, 0.15N Na_2SO_4 or deionized water (control). Solutions were applied as a soil drench (sufficient to saturate the container medium) or as a fine spray to all shoot surfaces (until runoff). A plastic cover was attached at the base of each sprayed plant to prevent any salt solution from reaching the soil medium.

Visual evaluations of injury were taken weekly after the initiation of the treatments. Shoots were harvested when any given treatment resulted in 100% injury and/or abscissing leaves. The plant tissue was then processed for Na and Cl analyses as described in previous papers (2, 3).

Results and Discussion

Appearance: Most holly taxa were adversely affected to varying degrees by NaCl treatments. The Na_2SO_4 treatments did not result in significant leaf discoloration or necrosis (browning) except in the case of several *Ilex crenata* Thunb. cultivars. Among the hollies tested the cultivars of the Japanese holly proved the most sensitive to the salts. The control plants of all taxa showed no injury and were actively growing. *Ilex cornuta* 'Burfordii', *I.* x *meserveae,* I. 'Nellie R. Stevens', *I. opaca* (spray) and *I. vomitoria* (soil) exhibited excellent salt tolerance.

The soil salt tolerance of *I.* x *attenuata* 'Foster #1' and 'Foster #2', was surprising in light of the susceptibility of *I. opaca* to soil salts. *I. opaca* is one of the parents of the Foster Hybrid Group. Apparently the other parent, *I. cassine* var. *angustifolium,* is responsible for the soil tolerance displayed by the hybrids. It would be interesting to test var. *angustifolium* to determine if the relationship is true.

Ilex cornuta 'Burfordii' showed excellent tolerance to soil and aerial salts. Unfortunately this plant is not hardy (sufficiently) in Zone 6 (Arnold Arboretum Hardiness Zone Map) and will not be a factor where de-icing salts are prevalent. Along coastal areas it would prove a good choice. *I. cornuta* 'Nana' was reasonably tolerant but not to the degree of 'Burfordii'.

I. crenata cultivars were uniformly and distinctly intolerant of spray and soil salts and could not be recommended for use in any type of saline environment.

Ilex glabra 'Compacta' was the first plant tested and since the plants showed no early response the experimental period was extended for 12 weeks. Most susceptible hollies (*I. crenata* cultivars) were severely injured after 5 to 7 weeks and were harvested. *Ilex glabra* shows good tolerance and the reason the appearance values are above 2 is related to the increased exposure time.

I. x *meserveae* showed surprising resistance to spray and soil salts. The soil-treated plants were somewhat stunted but did not show significant 'burning'.

I. 'Nellie R. Stevens' resisted both aerial and soil salts. *I. aquifolium* L. is a parent of both *I.* x *meserveae* and 'Nellie R. Stevens' and it is interesting to speculate that much of the tolerance may have been derived from that parent. We were unable to secure a source of *I. aquifolium* but future studies will include this taxon.

A most interesting relationship existed with the *I. opaca* cultivars. All showed good tolerance to aerial salts, but poor soil tolerance. This points up the importance of testing for aerial and soil tolerance. Mr. Eisenbeiss and Dr. Dudley have sent cuttings of an *I. opaca* plant from the estate of Mr. and Mrs. Jack Hirschmann in Marion, Mass., which they describe as follows: "beautifully fruited, very healthy tree, about 35 feet tall, standing no more than 5 feet from the edge of the water in an exposed site; the tree was not damaged although it had been subjected to severe salt spray during winter storms and extensive salt water drenching of the soil at high tides; the roots were covered with salt water for rather extensive periods."

Testing this particular clone for soil tolerance should prove most interesting.

I. pedunculosa Miq., which over the past few winters has proved to be one of the hardiest evergreen hollies, did not display good aerial or soil salt tolerance. Based on these studies the species falls into the moderate category.

Ilex vomitoria, which in a previous study (1) proved to be soil salt tolerant, displayed similar tolerance in this study. However, spray treatments induced severe injury.

Growth: In general, NaCl and Na_2SO_4 reduced dry matter production compared to the control. Na_2SO_4 did not result in as severe growth reductions as NaCl. The Na_2SO_4 spray treatments were less injurious than the soil treatments.

Sodium Content: Na tissue levels in no way reflected the degree or severity of injury. This type of relationship has proven true for other studies.

Chloride Content: In previous studies (2,3,4,) the relationship of tissue Cl content to severity of injury has been positive. The more pronounced the injury the greater the tissue Cl levels. Previous work has shown that Cl levels greater than 2 percent of tissue dry weight correspond closely with leaf necrosis and abscission as well as with overall plant decline. There are exceptions to this general rule, for some plants have the ability to accumulate high levels of Cl yet show little injury. The plants with the greatest salt tolerance, *I. cornuta* 'Burfordii', *I. glabra* 'Compacta', *I.* x *meserveae, I.* 'Nellie R. Stevens', *I. opaca* (spray), and *I. vomitoria* (soil) contain the lowest levels of Cl. It is worthwhile to emphasize the difference in Cl content of spray-treated plants, compared to soil-treated *I. opaca.* All spray-treated plants contained less than 1.5 percent Cl while soil-treated plants contained approximately 2.2 percent or greater. The reverse relationship was true for *I. vomitoria,* as the soil-treated plants contained the least Cl. Spray and soil-treated *Ilex pedunculosa* had comparable appearance ratings and similar Cl contents. The variances in response to soil and

spray-applied salts emphasize the need to evaluate plants under both conditions.

The relationship between tissue Cl and salt tolerance ratings is as follows: Plants exhibiting poor soil or spray tolerances have the greatest Cl levels, while the reverse is true for those rated as good. It is important to emphasize that no such relationship exists for Na content.

The relative salt tolerance ratings of the hollies included in this study are listed in Table 1. These are relative evaluations derived from plant responses under controlled conditions. If the plants were tested under highway conditions results may have differed slightly. There are too many variables involved with testing along highways or coastal areas. Poor soils, wind, air pollutants, lack of water, and nutritional differences are variables which mask the effects of salts. Testing must be carried out under relatively controlled conditions.

A more detailed paper will be published in one of the horticultural journals and will include most of the data which are too unwieldy for this article. Future plans include studies with the deciduous hollies as well as continued testing of the evergreen taxa. Anatomical work is being conducted on some of the hollies and will be reported upon at a future date. Through Mr. Eisenbeiss and Dr. Dudley's help, an American holly with suspected soil-salt tolerance is being propagated and will be tested. Studies with native populations of *I. opaca, I. glabra, I. vomitoria* and *I. verticillata* (L.) along the coast and further inland should be conducted if material can be secured.

Our studies to date have proven interesting and productive. Do not expect holly or any plant to survive if salts are supplied in a continuous and sustained manner. The premise that no plants are wholly immune to salts is, unfortunately, true.

We would like to thank the Holly Society for the grant support and hope the relationship continues in the future.

TABLE 1. Relative soil and spray salt tolerance of 19 holly taxa.[1]

Taxon	Spray			Soil		
	Good	Moderate	Poor	Good	Moderate	Poor
I. x *attenuata* 'Foster #1'		x		x		
I. x *attenuata* 'Foster #2'		x		x		
I. cornuta 'Burfordii'	x			x		
I. cornuta 'Nana'	x				x	
I. crenata 'Convexa'			x			x
I. crenata 'Green Island'			x			x
I. crenata 'Green Luster'			x			x
I. crenata 'Helleri'			x			x
I. crenata 'Hetzi'			x			x
I. crenata 'Highlander'			x			x
I. crenata 'Stokes'			x			x
I. glabra 'Compacta'	x			x		
I. x *meserveae*	x			x		
I. x 'Nellie R. Stevens'	x			x		
I. opaca 'Cave Hill #1'	x					x
I. opaca 'Hedgeholly'	x					x
I. opaca 'Longwood Gardens'	x					x
I. pedunculosa		x			x	
I. vomitoria			x	x		

[1] Relative tolerance determined by appearance and growth parameters. Since some taxa were exposed to salt for longer periods (*I. glabra* 'Compacta', *Ilex* x *meserveae)* than others, this was also taken into consideration.

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NEWS ITEM FROM KOREA

Mr. C. Ferris Miller, President of the Korea Holly Society, the first foreign chapter of the HSA, has reported enthusiastically on the September 1978 visit to Korea by Dr. Shiu-ying Hu - the world's foremost expert on holly - from the Arnold Arboretum. The Korea Holly Society conducted a tea to honor Dr. Hu at the former palace grounds in Seoul. One of the Korean language newspapers, "The Agriculture and Forestry News", had a reporter and photographer present at this event at which 25 dignitaries were in attendance. Gertrude K. Ferrar of the "Korea Times" was also present and featured this event and Dr. Hu's visit in a recent article in her paper.

Dr. Hu then travelled with Mr. Miller to the Chollipo Arboretum to study his extensive holly collections. Dr. Hu's definitive works are already well known to anyone interested in Asiatic Hollies. Her next major project, after finishing the *Flora of Hong Kong,* will be the *Hollies of the World,* which will be of great interest to all HSA members.

(T. R. Dudley)

PUBLICITY COMMITTEE REPORT

Dorothy Reed reports that "the response to our President's request for members to place arrangements of holly in local public areas during the Christmas holidays has been gratifying. The holly displays were so well received that I feel sure we will have requests for arrangements next year." The following people or organizations requested display cards, which were exhibited in over 100 places: Dr. and Prof. Yim Kyong-Bin, Fred C. Galle, Dance's Fine

Flowers, Eugene Caron, Mrs. J. B. Hirschmann, Weston Nurseries, Inc., Mr. & Mrs. L.W. Andrew, Pearl E. Podlich, Georgia Anne Boyer, Joseph H. Mountney, Barton M. Bauers, Samuel A. Reed, Thomas B. Barbour, Kay McLemore, Nicholas C. Anastor, Lloyd A. Harrison, Jack Gurewitz, Matthew Duck, James B. Hannan, William E. Wurtz, Giles T. Crowell, Edward Kratovil, Alfred Trufel Nursery, Inc., Norman H. Rolker, Charles W. Sinclair, Mrs. Ellen Fenwick, Jane Pepper, Mrs. Glenn F. Godden, Sidney J. Kincer, Elinor Zappalo, and James R. Randall.

The most recent records show that 30 requests have been received fror members for holly literature to purchase and place in libraries, which is a good start. Remember, this can be done at any time of the year - not just the holiday season! Requests have been received from the following: Cecil Pounders, John C. Durey, Jr., Robert H. Orr, Sara Burwell More, G. Paul Jones, Jr., Mr. and Mrs. Harold T. King, Gordon F. Moore, M.D., J. Patrick Tatum, C. M. Terry, William W. Rivers, Mr. and Mrs. C. A. Young, Jr., Mrs. Julian W. Hill, Jack B. Hirschmann, Radcliffe B. Pike, Fred Ebersole, Barton M. Bauers, Nancy Agin, James B. Hannan, W. K. Macy, Jr., Mrs. Albert P. Loening, James A. Webster, Ralph E. Hershberger, Elmer R. Sealover, Dr. John T. Brackin, Jr., Elizabeth Glenn Ravdin, M.D., Orlando S. Pride, William J. Dennis, Mrs. Mayo L. Mashburn, National Council of State Garden Clubs (Mrs. G. E. Waters), and Mr. and Mrs. William S. Weedon.

SYNOPSIS OF HOLLY DISEASES

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INTRODUCTION

Native and introduced hollies are popular landscape plants in many areas of the United States. Their ability to thrive under a variety of climatic conditions and their general lack of serious diseases have led to their widespread planting.

In a recently published popular handbook (29) several chapters were devoted to the special characteristics and utilization of holly cultivars and species that are available for today's landscape industry. In 1967, Smith and Keeble (39) published a bulletin on hollies for Georgia homeowners. This guide, from the Cooperative Extension Service of University of Georgia, provides information on varieties, their size and shape, their cultural requirements and berry production. A few of the common pests are mentioned. Other excellent articles on hollies are available: Holly Handbook (19) and Holly Hybridization at the National Arboretum (10) as well as the general book, *Hollies,* authored by Hume (21), which covers the history and botany of hollies, their propagation, pollination, planting, and culture.

Generally, insects are more pestiferous on hollies than are disease organisms. Such pests as leaf miners, spittle bugs, mites, and various scale insects can be extremely troublesome to growers and homegardeners. Nevertheless, a variety of diseases do occur on the various holly species and cultivars. Guba and Stevenson (16) published an invaluable bulletin on fungus and nematode inhabitants and diseases of holly. Yet, many reports are presented as single articles in various scientific journals (12,25,40) or in sections of books(35,36,43,45) which deal with variety of plants. Therefore, the primary purpose of this paper was to assemble some of the scattered information on the more important holly diseases, and together with a list of fungi reported to occur on specific species of holly, provide a convenient point of reference for those interested in identification of holly disease fungi.

LEAF SPOTS

Leaf spots on holly are due mainly to fungal organisms, but these can be confused with injury caused by insects, mites, physical damage or improper nutrition. The most common leaf spots incited by pathogens are described. Additional organisms are listed in the appendix.

Cercospora spp. - These fungi cause a definite outlined leaf spot that is limited in size. The spots are various shades of brown, and the complete leaf tissue from the upper to lower surface is affected. The affected areas are not always circular in shape but often have a ridge of purplish tissue between the healthy and diseased areas. The spores are long, thin and contain several septations. Found chiefly on *Ilex opaca* Ait., but also listed on *I. crenata* Thunb. (13) *I. cassine* L., and *I. cornuta* Lindl. (45), At least 3 *Cercospora* species have been implicated: *C. ilicis* Ell., *C. ilicisopacae* Chupp., and *C. pulvinula* Cke. Ell.

Cylindrocladium spp. - A relatively new leaf spot disease of landscaping holly reported in 1971 by Gill, Alfieri and Sobers (12), *Cylindrocladium avesiculatum,* causes severe leaf-spotting, defoliation, and twig dieback of *I. crenata, I. cornuta, I. opaca,* and *I. vomitoria.* It is also pathogenic to azalea and pyracantha in Georgia and Florida. Small chlorotic leaf spots that later turn purplish-black characterize the leaf symptoms on holly. Spores, of *C. avesiculatum* are borne on finger-like phialaides. They are long and narrow with 1 or 2 septations. Another *Cylindrocladium* species, *C. scoparium* Morgan, was reported on *I. crenata* by Timmonin and Self (42). It does not cause leaf spots but a water-soaking and discoloration of cuttings under conditions of high humidity. These fungi grow well on a modified yeast-extract-mannitol agar, forming sclerotial-like bodies and chlamydospores among orange-brown mycelium.

Elsinoë spp. - Known commonly as scab or spot anthracnose, it was first reported in 1950 by Plakidas (31) on Chinese holly. Apparently two type symptoms occur; one, prevalent in late autumn, is characterized by the presence of numerous black spots 1-2 mm in diameter on the upper leaf surface. These may unite to form irregular black patches over half the leaf surface. The second type of symptom develops in early summer. The large brown lesions (3.8 cm) penetrate through the leaf. Later the epidermis ruptures and sloughs off. The conidial stage is *Sphaceloma* sp. with unicellular, ovoid to ellipsoid spores. Ascospores are oblong, hyaline and septate. The fungus apparently has been found on species other than *I. cornuta* (13, 45).

Another leaf spot, also known as scab, was described by Brown (6) in 1970 on English holly (*I. aquifolium*) in the Pacific Northwest. This fungus, *Sclerophoma,* causes irregular swellings on the lower leaf surfaces. No spores have been observed on plants in the field, but they have formed in laboratory cultures. Contained in black oval pycnidia, the conidia are single-celled, hyaline, measuring 5-7 x 2-4 microns with one or two oil-like droplets inside.

Gloeosporium spp. - The fungus *Gloeosporium aquifolia* forms masses of one-celled spores in spots of light brown tissue. Sometimes the spore masses are pinkish or salmon-colored. The foliage may be brown or scorched and become detached from the twigs. The fungus also invades the twigs and branches, but not much information has been found concerning incubation requirements, It has been reported on *I. cassine, I. cornuta, I. opaca* and *I. aquifolium.* Often the disease is referred to as anthracnose.

Phyllosticta spp. - Species of these fungi, the conidial stage of which is *Physalospora,* cause whitish leaf spots with borders of reddish tissue. The hyaline 1-celled spores are borne in dark ostiolate pycnidia. Species include *P. concomitans, P. terminalis,* and *P. ilicicola.* Diseased leaves become dark gray and may become detached. Leaves of *I. crenata* 'Rotundifolia' with a heavy

infection of *P. ilicicola* (Cke. and Ell.) Ell. and Ev. were found in Georgia in 1952 (9). The ellipsoid or oval conidia varied in size from 8.5 - 11.5 x 5-7 microns. The symptoms of this disease might be confused with those resulting from the sequence of saprophytic or weakly pathogenic fungi on *I. crenata* after damage by spittle bugs. This author has observed *Pestalotia* developing repeatedly on 'Rotundifolia' foliage following spittle bug attack. Although White (46) reported *Pestalotia stellata* as a weak pathogen on scaled leaves of *I. opaca,* it is doubtful if it is a highly virulent pathogen on *I. crenata.*

Phacidium curtisii (Berk. & Rav.) Luttrell. - Referred to as tar spot on *I. opaca,* it occurs from southern New England to the Gulf States. The fungus initially causes yellowish spots which later turn a glossy black. The leaves may die the first season, but usually remain for the normal 2 years. The fungus morphology was described by Luttrell (25). Other tar spots are caused by several species of *Rytisma,* including *R. ilicincola,* and *R. prini* found on *I. cassine, I. decidua, I. verticillata,* and *I. vomitoria.* Tar spots should not be confused with superficial sooty mold fungi *Capnodium elongatum* or *Fumago* spp., that also occur on the upper surface of holly leaves. The sooty molds are not restricted to localized spots but may cover the entire leaf surface and can be scraped off with a fingernail.

Other fungal leaf-spots - Black spots on leaves of English holly in the Northwest can be due to the fungus *Phytophthora ilicis* (7) which occurs during cool moist periods from October to May. Defoliation results as the disease progresses into the stems and twigs.

Another fungus, *Microthyriella cuticulosa,* causes a black localized spot on *I. opaca* Ait.

Black patch, caused by at least three species of *Asterina,* is reported on *I. opaca* and *I. coriacea* in Southeastern U.S. and north to New Jersey. The circular patches found on the lower leaf surfaces apparently cause little damage to the plant. The perfect stages of certain *Asterina* species is *Englerulaster orbicularis.*

Leaf-spots due to causes other than fungi - English and American hollies in northern latitudes often have numerous purple spots on their leaves, particularly on the upper leaf surface. These may not be attributable to any fungus or other disease organism, but reportedly are due to the punctures caused from the leaf spines piercing the leaf tissue as they are battered about by the wind.

In Oregon holly orchards, Roberts et al. (32) found boron deficiencies to be the cause of irregularly shaped reddish or purplish spots on English holly. The spots developed on the upper leaf surface, but the under-surface was watersoaked. Concentric rings, bordered by yellow tissue, developed as the spots enlarged. Deficiency symptoms are vein enlargement, mesophyll collapse, misshapen leaves, and defoliation resulting where boron levels are estimated to be 15-20 ppm.

Other leaf-spotting problems occur on English holly in the Northwest. Herridge (20) described red spotting, then subsequent defoliation due to injury by copper sprays; raised rings of cork and red pigment due to mechanical wounding; and the water soaked, circular depressed black spots caused by midges (insects).

Recently tobacco ringspot virus was reported on nursery plants of *I. crenata* 'Rotundifolia' in Maryland (44). Leaves had yellow spots and were distorted but apparently plant growth was not reduced.

Davis and Coppolino (8) found American and Japanese holly, (*I. crenata* 'Hetzi') fairly resistant to injury by ozone (.25 ppm for 8 hours at bi-weekly intervals. Ozone or oxidants can cause a stippling on leaves of sensitive plants. The injury can mimic the symptoms caused by mites or insects.

TWIG BLIGHTS, DIEBACKS, AND STEM CANKERS

A variety of fungi have been reported as causing dieback of twigs, and stem cankers of hollies, including American and English holly. Many enter the plant through wounds. The twigs usually become dry, brown and shrivelled. Leaves may or may not remain attached. Cutting into the affected branch surface reveals ashen-gray or brown tissue instead of a healthy greenish-white color. The dead tissue can be colonized by non-pathogenic or decay fungi. As the tissue dries, the twigs become brittle and are easily broken. Some fungi and the respective twig canker dieback symptoms associated with their presence on hollies are listed. Several species may be associated with each genus.

Botryosphaeria spp. (dieback and canker) - Known to parasititize the stems of numerous woody plants, the fungus initiates a canker which usually starts as a sunken area that enlarges around the stem. Cracks may occur and the wood beneath becomes discolored. Locules or cavities of black bodies containing spores are embedded in the bark; 2 types of spores are produced.

Diaporthe spp. (canker) - Sunken shrivelled areas are found on stems and branches. Under high humidity, masses of spores may exude from the black pycnidia produced in chankers on the stem (*Phomopsis* stage). Two types of spores are produced; ovate or long filamentous, and sickle-shaped with a hook at upper end. The latter are called stylospores.

Fusarium spp. (dieback) - Reported to cause a wilt of current season's growth, and defoliation leaving curved bare twigs in late May or June. Newly killed leaves are black as if killed by frost. Cortex and pith became brown; xylem is not discolored (4).

Gloeosporium spp. (anthracnose) - The same fungus which attacks leaves may cause stem discoloration of terminal twigs of *I. cornuta* 'Burfordii' and subsequent defoliation. Reproduced on healthy seedlings by inoculation (40).

Phomopsis spp. (canker) - Brownish to grayish withered sunken areas on bark of stems and branches; wood is firm, not soft and spongy; the fungus produces pycnidia containing two types of single-celled hyaline spores; see *Diaporthe.* Leaves remain attached for a time before abcission occurs.

Septobasidium spp. (canker) - Caused by a felt fungus, it is wide-spread on many different woody plants, often found in association with scale insects. The fruiting body of the fungus is variable but usually dry and spongy with a smooth brown to black surface.

ROOT - ROTS

Dieback symptoms caused by above ground pathogens often are indistinguishable from those caused by roots killed by pathogens below ground. Unfavorable soil conditions (lack of oxygen, improper pH levels, cold temperatures, etc.) can adversely affect root growth, with symptoms being manifest as a twig dieback.

A few fungi have been reported to cause root-rot of hollies. There sometimes is difficulty in demonstrating pathogenicity of single organisms, because it is extremely difficult to duplicate artificially the viscissitudes of the natural environment which are conducive for specific symptom or disease development at the root.

Clitocybe tabescens (Fr.) Bres. (root-rot) - Reported to cause a state of decline of holly in the South, grows into the roots and main trunk over a long period before the leaves exhibit any yellowing. Mushrooms are sometimes present at base of shrub near main trunk in the fall. This fungus occurs on numerous trees and other shrubs.

Phymototrichum omnivorum (Shear) Dug. (root-rot) - This fungus causes a wilt, even suddenly, during mid-summer. Roots become covered with a mat of yellow or buff-colored fungus. Under moist conditions this mat may appear on soil surface, first as a white mass, then later becoming tan. Reported on *I. cassine, I. decidua, I. opaca* and *I. vomitoria* in Texas.

Polyporus spp. (root-rot) - Attacking the heartwood of living

specimens, several different species are known to be pathogenic to holly. The disease usually begins on roots and progresses toward the main trunk where the fungus may form a conk. The disease probably occurs on many native hollies.

Pythium spp. (root-rot) - Root damage to *I. crenata* 'Helleri' and *I. convexa* by species of *Pythium* will depend on moisture and temperature conditions in the soil (5). Causing a darkening and decay of roots, both fungi result in above ground yellowing and leaf death.

Thielaviopsis basicola (root-rot) - Recently observed (23) on diseased roots of container-grown Japanese hollies 'Hetzi' and 'Rotundifolia' in Virginia. The fungus resulted in delay of new growth in the spring. The cultivar 'Microphylla' was infected under greenhouse conditions.

NEMATODES

Plant parasitic nematodes may attack holly roots and establish a host parasite relationship which results in a decline in plant vigor because of root destruction by the nematodes or by subsequent attack of other pathogens. Aycock et. al. (1) reported that the ring nematode, *Criconemoides xenoplax,* and stunt nematode, *Tylenchorhynchus claytoni,* lowered plant vigor and top weights of 'Rotundifolia' holly after 3 years. Stunting, chlorosis, and leaf-drop were observed. 'Helleri' holly was severely stunted by the ring nematodes. Earlier, Hassis and Sasser (17) demonstrated excellent control of ring nematodes on holly with soil fumigants.

Barker and Benson (3) found 3 cultivars of Japanese holly to be intolerant of *Meloidogyne arenaria* in field microplots. At the end of the third growing season 91, 75, and 25% of the 'Helleri', 'Convexa', and 'Rotundifolia' were killed. Other plant parasitic nematodes including *Belonolaimus* spp., *Helicotylenchus* spp., *Hemicycliophora* spp., *Hoplolaimus* spp., *Paratylenchus* spp., *Pratylenchus* spp., *Trichodorus* spp., and *Xiphinema* spp. have been reported in association with hollies (13).

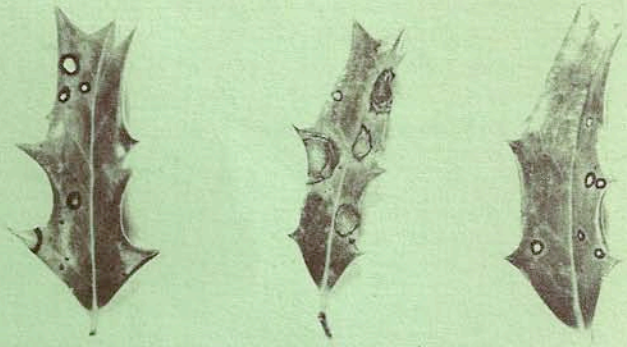
CONTROL OF HOLLY DISEASES

Copper fungicide applications at 2 week intervals beginning in late spring are recommended for control of tar spot (*Phacidium curtisii*) (30). For other leaf spots Bordeaux mixture or other copper - containing fungicides in late summer or fall may prove satisfactory, but copper fungicides can cause injury to some holly. In order to avoid the possible risk of injury from copper, the use of the dithiocarbomate fungicides is sometimes recommended (eg. Maneb (Dithane M-22), zineb (Dithane Z-78) or combinations of two (FORE), or ferbam (Fermate)).

The time of application is perhaps as important as the fungicide used. Many symptoms are observed in the spring but infection may have occurred in the previous fall. If that is the case, spray applications made in the fall would be more effective.

Newer fungicides such as benomyl (Benlate), captan, chlorothalonil (Daconil 2787), may have been tried on an experimental basis for control of holly leaf diseases. We tested Benlate and Daconil 2787 at rates greater than those commonly recommended for woody ornamentals. No phytotoxicity to 'Helleri' or 'Convexa' holly resulted. The best practice would be to consult the Cooperative Extension Service or Agricultural College at the state university for specific recommendations. Sanitary practices such as removal of dead twigs by pruning, destruction of fallen twigs, or removal of entire plants should be given prime consideration at all times even though such action may seem quite drastic. Avoid un-necessary wounding during rainy periods.

Chemical soil treatment for nematode control on living holly specimens is limited to only several chemicals and their use may be restricted to commercial growers. Most materials which can be utilized for nematode control are designed only as pre-plant treatments. Again, consultation with nematologists in the state agricultural colleges or extension service is emphasized for specific directions before any treatments are undertaken.



Cylindrocladium on *Ilex cornuta* (photo by Ed. Sobers)

Glossary of Scientific Terms

abscission - breaking away or cutting off of leaves from stems at a given point, resulting from formation of special cell layer in leaf petiole.

ascospores - spores produced in special fungus structure known as an ascus. Only present in the sac fungi (Ascomycetes).

chlorotic - yellowish green to bright yellow; used as descriptive term for symptoms.

chlamydospore - a thick-walled spore formed by the rounding up of fungus cells. May be dark in color.

conidia - plural of conidium; refers to condiospore; asexual spores which break or fall away from a stem (conidiophore) when mature.

conidial stage - the state of a fungus when asexual spores (conidia) are being produced.

cortex - tissue between the inner-most central part of plant roots and the outer bark region.

fungi - pl.; group of lower plants without chlorophyll which reproduce by sexual and asexual spores. Responsible for decay, many plant and animal diseases, and products useful to man.

hyaline - colorless, clear, transparent.

lesions - definite outlined areas of discolored tissue; limited in size.

locules - cavities formed in specialized hard, usually dark brown or black structures (stroma or stromata) of certain fungi, and containing spores.

mesophyll - a tissue found in the lower cross section of green leaves. Usually refers to spongy mesophyll, where cells are not compactly arranged.

mushroom - a fruiting body of specific fungi belonging to the group known as Basidiomycetes. Usually referring to the agrics or toadstools.

mycelium - the thallus or vegetative mass of a fungus body made up of thin thread-like strands (hyphae).

non-pathogenic - not having the capability to cause disease.

ostiolate - having a pore (ostiole) by which spores are liberated from a fungal fruiting body.

parasitic - describing an organism getting its food from another living organism (host) by living on or in that organism.

pathogenic - having the capability to incite or cause disease.

perfect stage - referring to the sexual stage or state rather than to the vegetative or asexual stage. Useful for proper identification of fungi. Nuclear fusion must take place in cells before sexual spores are produced. If no perfect stage is known, then fungi are classed in group called Fungi Imperfecti.

phialaides - 1 celled, flask-shaped structures at the end of which spores are produced.

pycnidia - hard, usually rounded, blackened body of certain fungi in which asexual or vegetative spores are produced. Can be observed with naked eye. Spores may exude during moist weather.

sclerotial - descriptive of the sclerotium or firm mass of hypae with or without host tissue that normally does not contain spores. May be capable of continued growth of vegetative hyphae following adverse conditions.

septations - cross walls, found perpendicular to the length of hyphae or spores, providing cell configurations; sometimes used in keys for identification purposes.

stylospores - a spore borne on a pedicel or hypha tip - sometimes long and thin with a crook at one end.

xylem - water conducting vessels, found in green plants; the woody portion of trees and shrubs is composed mostly of xylem tissue.

FUNGI REPORTED TO OCCUR ON MAJOR CULTIVATED SPECIES OF HOLLY

The author does not imply that each fungus on this list is necessarily the cause of serious disease on the specified holly species. Indeed, the disease potential of many fungi may be unknown, may be relatively weak, or if pathogenic, may be expected to occur only under restricted environmental conditions.

AMERICAN HOLLY - *Ilex opaca* Ait.

Dieback of Twigs:

Botryosphaeria dothidea (Moug. ex Fr.) Ces. & de Not.
Botryosphaeria ribis Gross & Dug.
Botryosphaeria philoprina (Berk. & Curt.) v. Arx & Müller
Botrytis cinera Pers. ex Fr.
Calosphaeria subcuticularis (Cke' & Ell.) Ell. & Ev.
Corticium stevensii Burt.
Cylindrocladium avesiculatum Gill, Alf. & Sob.
Cytosporella sp.
Diplodia sp.
Englerulaster orbicularis (Bert. & Curt.) Hoehn.
Fusarium solani (Mart.) Appl. & Wr. var *martii* (App. & Wr.) Wr.
Laestadia philoprina (Berk. & Curt.) Sacc.
Macrophoma sp.
Nectria coccinea Fr.
Pellicularia koleroga Cke.
Phomopsis sp.
Physalospora ilicis (Fr.) Sacc.
Physalospora obtusa (Schw.) Cke.
Physalospora rhodina (Berk & Curt.) Cke.
Septobasidium alni Torr.
S. castaneum Burt.
S. curtisii (Berk. & Sesm.) Boed. & Steinm.
S. patouillardii Burt.
S. pseudopedicellatum Burt.
S. sinuosum Couch

Leaf Spots:

Alternaria sp.
Botryosphaeria sp.
Cercospora ilicicola Maubl. or Lieneman
C. ilicicola - opaceae Chupp
Cercospora ilicis Ell.
C. pulvinula Cke. & Ell.
Chyrsomyxa ilicina (Ell. & Ev.) Arth.
Cylindrocladium avesiculatum Gill, Alf. & Sob.
Diplodia sp.
Discosia sp.
Englerulaster orbicularis (Berk. & Curt.) Hoehn.
Entomosporium sp.
Gloeosporium ilicis Dearn.
Leptothyrium foraminulatum Sacc. & Ell.
Macrophoma phacidiella (Sacc.) Berl. & Vogl.
Metasphaeria ilicis Ell. & Ev.
Microthyriella cuticulosa (Cke.) Hoehn.
Mycosphaerella ilicella (Cke.) House
Pestalotia stellata Berk. & Curt.
Phacidium curtisii (Bert. & Rav.) Luttrell
Phacidium ilicis Lib.
Phacidium multivalve Fr.
Phyllosticta opaca Ell. & Ev.
Phyllosticta terminalis Ell. & G. Martin
Physalospora ilicis (Fr.) Sacc.
Physalospora rhodina (Berk. & Curt.) Cke.
Rhytisma ilicincola (Schw.) Fr.
Rhytisma velatum (Schw.) Fr.

Other Leaf or Stem Inhabiting Fungi:

Amerodothis ilicis (Cke.) Th. & Syd.
Coniothyrium ilicinum Ell. & F. W. Anderson
Diatrypella opaca Cke.
Diatrypella quercina (Pers. ex Fr.) Nits.
Disocosia minima Berk. & Curt.
Fusicoccum ilicinum Ell. & Ev.
Gloeosporium ilicis Dearn.
Leptothyrium foraminulatum Sacc. & Ell.
Microsphaera alni DC. ex Wint.
Nectria coccinea Pers. ex. Fr.
Pestalotia annulata (Berk. & Curt.) Hoehn.
Pestalotia stellata Berk. & Curt.
Phoma ilicina Ell. & F. W. Anderson
Phyllactinia corylea Pers. ex Karst.
Physalospora ilicis (Fr.) Sacc.
Physalospora philoprina (Berk. & Curt.) Sacc.
Rhabdospora (Cke. & Ell.) Kuntze
Rhizoctonia solani Kuhn [*Thanatephorus cucumeris* (Frank) Donk]
Saccardia martinii Ell. & Sacc.
Septobasidium castaneum Burt.
S. sinuosum Couch
Septoria ilicifolia Cke. & Ell.
Septoria orthospora Lev.
Septoria stemmatea (Fr.) Berk.
Sporonema ilicis Earle
Tyblidiella rufula (Spreng. ex Fr.) Sacc.

Black Patch or Black Mildew and Sooty Mold:

Asterina ilicis Ell.
Capnodium elongatum Berk. & Desm.
Lembosiopsis brevis (Tracy & Earle) Th.

Wood Rot:

Fomes australis Cke.
Polyporus versicolor L. ex Fr.
Poria inermis Ell. & Ev.
Poria nigrecens Bres.
Poria versipora (Pers.) Rom.
Schizophyllum commune Fr.
Ustulina deusta (Hoffm. ex Fr.) Petr.

Other Wood Rots:

Daedalea unicolor Fr.
Daldalea confragosa Fr.
Daldinia vernicosa (Schw.) Ces. & de N.
Lachnella pulveracea (Alb. & Schw.) Seaver
Pleurotus ostreatus Fr.
Polyporus adustus Willd. ex Fr.
Polyporus brumalis Fr.
Polyporus hirsutus Fr.
Polyporus pargamenus Fr.

Root Rots:

Clitocybe tabescens (Scop. ex Fr.) Bres.
Corticium galactinum (Fr.) Burt.
Phymatotrichum omnivorum (Shear) Dug.
Rhizoctonia solani Kuehn

On Dead Wood or Twigs:

Dacrymyces fuscominus Coker
Diaporthe illicis (Ell. & Ev.) Wehm.
Diaporthe oxyspora (Pk.) Sacc.
Diatrypella opaca Cke.
Discosia artocreas Fr.
Discosia deflectens Sacc.
Fomes applantus (S. F. Gray) Gill.
Hypoxylon deustum (Fr.) Grev.
Hypoxylon fuscum Fr.
Hypoxylon rubiginosum Fr.
Laxitextum crassum (Lev.) Lentz
Phlenogena faginea (Fr.) Lk.
Sphaeropsis ilicina (Ell. & F. W. Anderson) Kuntze.
Stereum complicatum (Fr.) Fr.
S. rameale Schw.
S. striatum (Fr.) Fr.
S. sericcum Schw., *S. umbrinum* Berk. & Curt.
Tryblidiella refula (Fr.) Sacc.
Tympanis picastra Berk. & Curt.
Valsa dissepta Fr.
Xylaria filiformis Fr.

ENGLISH HOLLY - *I. aquifolium* L.

Dieback of Twigs:

Boydia insculpta (Fr.) Grove
Cladosporium herbarum Lk.
Diplodia sp.
Diaporthe eres Nits.
Gloeosporium aquifolii Penz. & Sacc.
Macrophoma phacidiella (Sacc.) Berl. & Vogl.
Nectria galligena Bres.
Phoma ilicina Ell. & F. W. Anderson
Phomopsis crustosa (Sacc.) Bomm. & Rouss.

Physalospora ilicis (Fr.) Sacc.
Phytophthora ilicis Buddeah. & Young

Leaf Spots:

Ceuthospora phacidioides Grev. (*Phacidium multivalve* K. & S.)
Gloeosporium aquifolii Penz. & Sacc.
Pellicularia filamentosa (Pat.) Rogers (*Rhizoctonia solani* Kuehn)
Phoma ilicina Ell. & F. W. Anderson
Phoma phacidiella (Cke. & Ell.) Sacc.
Phyllosticta sp.
Physalospora ilicis (Schlecher ex Fr.) Sacc.
Sclerophoma sp.

Other Leaf Problems:

Ceuthospora phacidioides Grev.
Cladosporium herbarum Lk.
Fumago vagans Pers.
Metasphaera ilicis Ell. & Ev.
Thielavia basicola (Berk. & Br.) Zopf.
Trochila ilicis (Chev. ex Fr.) Crouan

Wood Rots:

Polyporus adustus Willd. ex Fr.
Polyporus hirsutus Fr.

JAPANESE HOLLY - *I. crenata* Thunb.

Dieback of Twigs:

Botryosphaeria dothidea (Moug. ex Fr.) Ces. & de Not.
Cylindrocladium scoparium Morgan
Phomopsis sp.
Physalospora ilicis (Fr.) Sacc.

Leaf Spots:

Alternaria sp.
Botryosphaeria sp.
Cercospora sp.
Clindrocladium avesiculatum Gill, Alf. & Sob.
Phyllosticta sp.
Physalospora ilicis (Schleicher ex Fr.) Sacc.

Root Rots:

Armillaria mellea Vahl. ex Fr.
Phytophthora parasitica Dast.
Pythium irregulare Buis.
Pythium vexans D. By.
Rhizoctonia solani Kuehn
Thielaviopsis basicola (Berk. & Br.) Ferr.

CHINESE HOLLY - *I. cornuta* Lindl. & Paxt.

Dieback of Twigs:

Botryosphaeria sp.
Cylindrocladium avesiculatum Gill, Alf. & Sob.
Diplodia sp.
Gloeosporium sp.
Macrophoma sp.
Phomopsis sp.

Leaf Spots:

Alternaria sp.
Cercospora ilicis Ell.
Coniothyrium sp.
Cylinderocladium avesiculatum Gill, Alf. & Sob.
Elsinoë ilicis Plak.
Gloeosporium ilicis Dearn.
Phyllosticta terminalis Ell. & Martin.
Physalospora ilicis (Schleicher ex Fr.) Sacc.
Sphaceloma sp.

Root Rots:

Pythium sp.
Rhizoctonia ramicola Roberts & Weber
R. solani Kuehn

POSSUMHAW - *Ilex decidua* Wait.

On Branches or Twigs:

Cenangella ravenelii (Berk. & Curt.) Sacc.
Diatrypella favaceae (Fr.) Nets.
Microdiplodia ilicigena Fairm.
Myriangium asterinosporum (Ell. & Ev.) J. H. Miller
Septobasidium leprosum Couch
Septobasidium patouillardii Burt.

Leaf Spots or Leaf - inhabiting Fungi:

Amerosporium ilicinum Ell. & Ev.
Microsphaera alni DC. ex Wint.
Mycosphaerella sp.
Phyllactinia corylea Pers. ex Karst.
Phyllosticta conomitans Ell. & Ev.
Rhytisma ilicincola (Schw.) Fr.
R. prini (Schw.) Fr.
R. velatum (Schw.) Fr.

Root Rot:

Phymatotrichum omnivorum (Shear) Dug.

INKBERRY - *Ilex glabra* (L.) Gray

On Branches or Twigs:

Botryosphaeria dothidea (Moug. ex Fr.) Ces. & de Not.
Cenangium tuberculiforme Ellis & Ev.
Dermea olivacea Otth
Dermea peckiana (Rehm) Groves
Nectria rubricarpa Cke.
Septobasidium cremeum Couch
Septobasidium leprieuri (Mont.) Pat.
Valsa decorticans Fr.

Leaf Spots or Leaf-inhabiting fungi:

Asterina spp.
Capnodium elongatum Burk. & Desm.
Cercospora ilicis Ell.
Echidnodella augustiformis (Tracy & Earle), F.L. Stevens & Ryan
Englerulaster orbicularis (Berk. & Curt.) Hoehn.
Morenoella ilicis (Tracy & Earls) Th.
Pestallotia stellata Berk. & Curt.
Phacidium curtisii (Berk. & Ray.) Luttrell
Phacidium sphaeroideum Cke. & Ell.

Root Rot:

Phytophthora cinnamomi Rands

Wood Rot:

Poria inermis Ell. & Ev.

WINTERBERRY - *Ilex verticillata* (L.) Gray

On Branches or Twigs:

Cenangella ravenelii (Berk.) Sacc.
Dendrophoma nigrescens Fairm.
Dermea peckiana (Rehm) Graves
Diaporthe ilicis (Ell. & Ev.) Wehm
Diaporthe oxyspora (Pr.) Sacc.
Godroniopsis nemopanthis Grove
Myriangium asterinosporum (Ell. & Ev.) J.H. Miller

Leaf Spots or Leaf-inhabiting Fungi:

Gloeosporium niveum J. J. Davis
Microsphaera alni DC. ex Wint.
Phyllosticta haynaldi Roum. & Sacc.
Physalospora ilicis (Schleicher ex Fr.) Sacc.
Ramularia prini Pk.
Rhytisma concavum Ell. & Kell.
Rhytisma prini (Schw.) Fr.

DAHOON - *Ilex cassine* L.

On Branches or Twigs:

Diathrypella favaceae (Fr.) Nits.
Phomopsis sp.
Tryblidiella hysterina (Drof.) Shear
Tryblidiella rufula (Spreng. ex Fr.) Sacc.

Leaf Spots or Leaf-inhabiting Fungi:

Alternaria sp.
Capnodium elongatum Berk. & Desm.
Cercospora pulvinula Cke. & Ell.
C. illicis Ell.

Englerulaster orbicularis (Berk. & Curt.) Hoehn.
Gloeosporium ilicis Dearn.
Mycosphaerella ilicis (Ell. & Ev.) Lindau
Pestalotia annulata (Berk. & Curt.) Hoehn.
Phyllosticta terminalis Ell. & Martin
Rhytisma ilicincola (Schw.) Fr.

Root Rot:

Rhizoctonia solani Kuehn

YAUPON - *Ilex vomitoria* Ait.

On Branches or Twigs:

Cylindrocladium avesiculatum Gill, Alf. & Sob.

Leaf Spots or Leaf-inhabiting Fungi:

Capnodium elongatum Bark. & Desm.
Cylindrocladium avesiculatum Gill, Alf. & Sob.
Rhytisma ilicincola (Schw.) Fr.
Rhytisma prini (Schw.) Fr.

Root Rot:

Phymatotrichum omnivorum (Shear) Dug.

MOUNTAIN HOLLY - *Ilex ambigua* (Michx.) Chapm.

On Branches or Twigs:

Diaporthe oxyspora (Pk.) Sacc.
Physalospora obtusa (Schw.) Cke.
Rhabdospora ilicigena Faism.

Leaf Spots or Leaf-inhabiting Fungi:

Microsphaera penicillata (Wallr. ex Fr.) Lev. (Syn. *Microsphaera alni* DC. ex Wint.)
Phyllosticta concomitans Ell. & Ev.
Rhytisma prini (Schw.) Fr.

Wood Rot:

Poria inermis Ell. & Ev.

UNSPECIFIED HOLLY SPECIES

Botryosphaeria sp. - on cuttings, twigs, branches
Cenangella revenelii (Berk. & Curt.) - on branches - on dead leaves
Cercospora sp. - leaf spot
Corticium calmonicolor Ber. & Br. - limb blight
Cylindrocladium avesiculatum Gill, Alf. & Sob. - leaf spot
Diplodia sp. - leaf spot, dieback
Elsinoë ilicis Plakidas - scab
Elsinoë sp. - leaf spot
Englerulaster orbicularis (Berk. & Curt.) Hoehn. - blackspot
Fusarium sp. - stem rot of cuttings
Gloeosporium sp. - on cuttings
Leptothyrium foraminulatum Sacc. & Ell. - leaf spot
Macrophoma sp. - leaf spot, dieback
Microsphaera alni DC. ex Wint. - powdery mildew
Morenoella ilicis (Tracy & Earle) - black spot
Mycosphaerella ilicis Lindau - leaf spot
Phacidium curtisii (Berk. & Rav.) Luttrell - tar spot
Phoma ilicina -Ell. & F. W. Anderson - dead holly leaves
Phomopsis sp. - Blight, dieback
Phyllachora sp. - leaf spot
Phyllosticta sp. - leaf spot
Phyllosticta terminalis Ell. & Martin - leaf spot
Physalospora ilicis (Schleicher ex Fr.) Sacc. - leaf spot
Rhizoctonia ramicola Roberts & Weber. - thread blight
Rhizoctonia solani Kuehn - root rot
Rhytisma ilicincola (Schw.) Fr. - tar spot
Septoria ilicifolia Cke. & Ell. - leaf spot
Trochila ilicina (Nees ex. Fr.) Greenhalgh - on leaves
Winterina lobata (Tracy & Earle) Sacc. & Syd. - leaf spot.

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(2, 11, 13, 14, 15, 16, 18, 22, 24, 25, 26, 27, 28, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 45, and 46).

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EDITOR'S NOTE: The following corrections should be noted for *Holly Letter* #62, September 1978: 1) G.K. Eisenbeiss and T.R. Dudley are the authors of the International *Ilex* Registration article; 2) Pg. 8, line 6 "...*N.collinus* (Alexander) Ross Clark...", not Robert Clark; pg. 3, lines 11 and 12, should read "... i.e. *Cornus* 'Steeple', 5 cultivars of *Ilex...*". In Holly Letter #61, 1978, authorship of "Holly Hunters Haunt Hammocks" was incorrectly cited and a paragraph omitted; the correction follows:

The previous editor incorrectly attributed authorship of this article to "Dr. Albert A. Piringer, Assistant Area Director, USDA, Federal Building, Hyattsville, MD., 20782". The article should be correctly attributed to T.R. Dudley and G.K. Eisenbeiss, U.S. National Arboretum. These *Ilex* specialists authored the article by invitation, and submitted it to Dr. Piringer for xerox duplication in the 27 April 1978 issue (No. 78-8) of the *Notes from the Area Director,* Science and Education Administration, USDA. It was subsequently sent for inclusion in Holly Society literature.

Regrettably, an important paragraph was omitted from the published version. The omitted paragraph is as follows:

Dr. Dudley and Mr. Eisenbeiss were accompanied on portions of their exploration of Alabama, Louisiana, Mississippi and northern Florida by Dr. John Giordano, Jr., Dr. John Allen Smith and Mr. Glenn Burnham, all Holly Society members from Mobile, Alabama. This Alabama "Trivumvirate of Ilicophiles" led the National Arboretum plant explorers to numerous exciting sites of native deciduous hollies and rare evergreen taxa, that would otherwise have remained undiscovered. Without the extreme courtesy, very obvious expertise, and guidance of our Alabama colleagues, many populations of rare species of *Ilex* would have remained in obscurity. In particular Mr. Burnham discovered for us a unique habitat that contained extensive populations of *Ilex longipes, I. ambigua* and the elusive *I. beadlei* growing side by side.

(T. R. Dudley)

Finally, on p. 17, under International *Ilex* Registration - 1978, registration 1-78 and 2-78 should cite *Holly Letter* No. 62, not 61.

PLANT FINDER'S GUIDE

Since the announcement and explanation of this Holly Society of America service in the No. 61 (July, 1978) and No. 62 (September, 1978) issues of the *Holly Letter*, two requests for source information were received by the previous editor in the late autumn of 1978.

1. Mr. Cecil Pounders, Horticulturist of the Alabama Cooperative Extension Service, District 1 Office, Courthouse, P.O. Box 1904, Decatur, Alabama 35601. Mr. Pounders requests information about any private, nursery, and arboretum sources of small plants or cuttings of *Ilex vomitoria* 'Aurea', 'DeWerth', 'Grey's Littleleaf', 'Huber's Compact', 'Pyramidalis', 'Schilling's Dwarf' and 'Yawkeyii' (='Yawkey').

2. Mr. Kris Jarantoski, Horticulturist, Chicago Horticultural Society, P.O. Box 400, Glencoe, Illinois 60022. Mr. Jarantoski requests information about any private, nursery, or arboretum sources of *Ilex rugosa.* He writes that the Chicago Horticultural Society has need of about 15 female and five male plants or cuttings.

Any Holly Society member or reader who wishes to assist or cooperate is urged to communicate directly with the requestors.

(T.R. Dudley)

KOREA BRANCH MEETS

The Korea Branch of the HSA held its first 1979 meeting on 24 January at the home of Mr. Un-cho Kim, the secretary-treasurer. About forty people attended, among them several Shingu College students who are majoring in landscaping. Mr. C. Ferris Miller, president, introduced the Society and reviewed some of the Branch's activities. The framed certificate of approval for the Korea Branch from the HSA was presented to the meeting and is to be hung in the office of the secretary-treasurer. Dr. Kyong-bin Yim reported on the status of his study on the distribution and variability of *Ilex cornuta* in Korea. Mr. Un-cho Kim distributed a four-page pamphlet which he had prepared that introduces Korean hollies. After the business meeting, Mr. Miller gave an excellent slide presentation, and then a superb, traditional, Korean New Year's dinner provided a fitting climax to a highly successful meeting.

A Note to Contributors:

Please double-space your articles on standard paper, leaving one-inch margins. This helps the editor to estimate the overall length of each publication. Thank you.

MEMBERSHIP DRIVE

Daniel G. Fenton, Jr.
Chairman, Membership Committee

The membership committee is preparing a plan which would foster the participation of horticultural students in HSA functions.

The plan, proposed by President Bauers, would permit interested students to join the society for a reduced rate. This student membership would entitle bonafide under-graduate students to receive full benefits for a period of no longer than four years at an annual membership cost of five dollars per year.

Starting with the 56th annual meeting in St. Louis a special registration fee of $1.00 will be offered to horticultural students from local colleges. Through correspondence and/or contacts with the individual departments, we will seek a required session of attendance by horticultural students. The one dollar fee would permit the student to participate in any or all sessions but would not include tours or meals, etc.

The idea of running an advertisement in the classified section of the magazine "Pacific Horticulture" has been proposed by Ted Dudley. This publication is based in San Francisco, California and distributed primarily in the western part of the United States. Advertising rates and further information have been recently requested.

Rates have been obtained, courtesy of Ted Dudley, for plant

society advertisements in the AABGA bulletin. This bulletin is edited by Dr. Robert Montgomery, director Tyler Arboretum, Lima, PA., and is circulated to arboreta, botanical gardens, and similar plant-related institutions, with a total circulation of about four thousand. A half-page ad is currently being prepared for a spring issue.

This advertising of the HSA should not be limited to horticultural publications. In keeping with our new approach to get more people knowing and growing more holly, a poster would be most effective. Anyone who has an idea for a poster is invited to send it to me: Daniel G. Fenton, Jr., American Holly Products, Inc. Box 754, Millville, New Jersey 08332. Your participation will be greatly appreciated.

Finally, I would like to say that being a member of the Holly Society of America is an honor. Many of the finest people in America are, or have been, members of this Society. The membership committee would like to assure the membership at large that it will make certain that no advertising will be misdirected and that all material will be tastefully prepared.

More People Knowing and Growing More Holly.

THE HOLLY SOCIETY OF AMERICA, Inc.
407 FOUNTAIN GREEN ROAD
BEL AIR, MARYLAND 21014

Address Correction Requested