OCTOBER 1972

The Boxwood Bulletin

A QUARTERLY DEVOTED TO MAN'S OLDEST GARDEN ORNAMENTAL

One of the giant topiary peacocks that preside over the gardens and allees of Heronwood at Upperville, Virginia. Skilfully and lovingly trained and clipped over many years, it has become a superb example of boxwood topiary, equal to the best anywhere. *Photo by Admiral Phillips*

Boyce, Va. Vol. XII No. 2

Address: The American Boxwood Society,
Box 85, Boyce, Virginia 22620

Headquarters, Blandy Experimental Farm (U. of Va.), Boyce, Va.

Please address all communications, including manuscripts and change of address to the Boxwood Bulletin, Boyce, Va.

The Boxwood Bulletin is published four times a year by the American Boxwood Society in the quarters beginning with October, January, April, and July.

A subscription to the Boxwood Bulletin is included as one of the benefits of membership in the American Boxwood Society.

The Bulletin is $5.00 per annum to non-members in the United States and Canada; single numbers are $1.50 each.

Reprints will be supplied to members and authors at cost but should be ordered at the time of an article's acceptance for publication.

Make cheques payable to the American Boxwood Society.

The Editors solicit and will welcome contributions of articles, news notes, photographs suitable for reproduction, of boxwood specimens, gardens, and plantings, and other items of probable interest to readers. While every effort always will be made for the protection of all material submitted for publication, the Editors cannot assume responsibility for loss or injury.

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The Boxwood Bulletin

October 1972 Vol. XII No. 2

EDITOR — MRS. EDGAR M. WHITING

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ILLUSTRATIONS

The American Boxwood Society

OCTOBER MEETING OF OFFICERS AND DIRECTORS OF ABS

PRESIDENT'S REPORT

A meeting of officers and directors of the American Boxwood Society was held on Thursday, October 19, 1972, at the University of Virginia in Charlottesville, with Dr. B.F.D. Runk of the University as host. Present, Mrs. Whiting, Dr. Singleton, Professor Beecher, Mr. Ewart and the President, Admiral Phillips. Also present by invitation were Dr. Wirt Wills and Mr. George Montgomery of V.P. & S.U.

The Chairman called attention to the minutes of the last general meeting as published in the July issue of the Bulletin. The minutes were approved as printed.

An excellent financial report was submitted by our Secretary-Treasurer, Mrs. Kirby. In accordance with her recommendations a motion was unanimously approved to pay V.P.I. & S.U. the balance of $3,000 pledged by ABS for the boxwood research project for the current year, as follows; $2,000 immediately and $1,000 on or after March 28, 1973, when our time-deposit in the savings account matures. Dr. Wills stated that this arrangement is sitisfactory to V.P.I. & S.U.

It was agreed that with the publication of the January issue of our Bulletin, in which the V.P.I. research program, as well as the University of Maryland research in boxwood nutrition, to which ABS contributes substantially, will be more thoroughly reported, we shall begin a concerted drive to raise the $5,000 needed to carry on a second year (fiscal 1973-1974) of the program. Meanwhile, if members and friends of ABS wish to make a contribution (tax deductible for the year if made before the end of December) to ABS in 1972 for the program, it will be most welcome. Checks should be made out to The American Boxwood Society and marked "Research program," and mailed to Mrs. Andrew Kirby, Blandy Experimental Farm, Box 85, Boyce, Va. 22620.

A recommendation by Mrs. Whiting was approved; to publish the names of contributors to this fund in the Bulletin, but not the sums contributed. This procedure is in accordance with the general custom of other horticultural bodies, such as the Garden Club of America. Any contributor who wishes to remain anonymous is requested to specify this when sending his or her check.

Mrs. Kirby requested clarification of rules for dual membership (e.g., husband and wife) A reexamination of the constitution of ABS showed that dual memberships are not provided for. The spouse of an individual Member is most welcome to attend ABS meetings and activities, but does not hold voting rights unless he or she is also a dues-paying Member. If both husband and wife are Members but do not wish to have duplicate Bulletins, etc., sent to them, they are requested to notify Mrs. Kirby.

A report on rampant boxwood diseases (especially in English boxwood) was received from the V.P.I. representatives. It is *bad, bad, bad;* in some localities the diseases are reaching epidemic proportions. Dr. Wills will give a more extensive report in the January Bulletin. An article from Dr. Lambe of V.P.I., carried in this October issue, confirms the *essential* importance of the boxwood pathology research now in progress at V.P.I. Dr. Wills stated that V.P.I. very much wishes boxwood growers to continue to send in data and specimens of boxwood plants. Elsewhere in this October Bulletin there is published a directive on how to collect and mail diseased specimens.

Mr. Ewart, the new head of Blandy Farm, reported on operations there and on the ABS collection of boxwood; he asked for help in identifying some of the specimens which have lost their labels.

Guided by Dr. Runk, the group lunched at the Colonnade Club and then walked through the splendid grounds of the University, admiring the Jeffersonian buildings and the late but lovely flowers in the secluded walled gardens.

Respectfully submitted,

Neill Phillips
President

SECRETARY'S REPORT

Thirty-three new members have been enrolled since May 1; seven were removed by request, and we learned, regretfully, of the death of two members: Dr. Brae Rafferty of Connecticut and Mr. C. C. Crabill of Strasburg, Virginia, formerly Arboretum Assistant at the Orland E. White Arboretum, Blandy Farm.

The Bulletin now goes out to 553 members and 29 subscribers (non-members), with 25 complimentary copies going to various institutions. Two complete sets of the Bulletin were sold recently, as well as other extra copies.

Contributions to the $5,000 fund for the support of the V.P.I. & S.U. research program on boxwood decline have already been received from these members: Mrs. Ruth Donovan, Mr. Robert Plott, Mr. and Mrs. G. Gamble, and Boxwood Study Group, St. Louis.

The membership at present consists of 455 Regular members, 67 Contributing, 10 Sustaining, 17 Life Members, and 4 Honorary Life — making a total of 582. A second reminder about dues payable was mailed to 82 members on October 10.

Respectfully submitted,

Anna C. Kirby
Secretary-Treasurer

THE AMERICAN BOXWOOD SOCIETY

TREASURER'S REPORT

to Officers-Directors Meeting,
October 19, 1972.

Balance in checking account May 1, 1972			$1,708.14
Receipts (May 1 to Oct. 12)			
Membership dues and Non-Member Subscriptions	2,967.00		
Extra Bulletins sold	137.40		
Interest on CD #1025	50.00		
Gifts	255.00		3,409.40
			5,117.54
Disbursement (May 1 to Oct. 12)			
Cost of Boxwood Bulletin			
Printing (2 issues)	560.00		
Copyright (2)	12.00		
Mailing plates, postage, manila envelopes, etc.	136.45		
Cuts, Photo, etc.	193.10	901.55	
Secretarial Services		75.04	
Office supplies, stamps postage		33.74	
Contribution to VPI & SU 7/11/72		2,000.00	
Total payments 5/1-10/12/72			3,010.33
			2,107.21
Money in savings account transferred to checking account 7/11/72			959.22
Total in Checking account 10/12/72			3,066.43
C/D #1025, due March 28, 1973			2,000.00
Total assets 10/12/72			5,066.43

Schedule of Payments For Research Projects

University of Maryland Research Project obligation:

Calendar year 1971	700.00 paid 5/12/71
Calendar year 1972	1,500.00 paid 3/7/72
Calendar year 1973	800.00 due by 4/1/73

Virginia Polytechnic Institute and State University Research Project,

July 1, 1972 to July 1, 1974:	$10,000
First Year (1972-73)	$5,000.00
Payment #1 —7/11/72	2,000.00
Amount to be paid by 7/1/73	3,000.00

ABS checking balance 10/12/72		$3,066
Less payment (#2) to VPI & SU (*if approved*)	2,000	
Estimated cost of Bulletin (low estimate)		
Oct. 72 — $350		
Jan. 73 — 350	700	2,700
Balance left to take care of incidentals until CD is cashed March 28, 1973		366
C/D #1025 converted 3/28/73 will add (plus $50 interest)		2,000
		2,366
		50
		2,416
Payments then can be made to		
Univ. of Md (#3 due 4/1/73)	800	
VPI & SU (#3 due 7/1/73)	1,000	1,800
		616

Some expenses anticipated (estimated):

Index now being prepared	$200
Secretarial services	50
Boxwood registrations	?
Annual billing (April '73) printing & postage	75

(All accounts are in the Bank of Clarke County, Berryville, Va.)

Anna C. Kirby
Secretary-Treasurer

On October 27 Mrs. Kirby sent the Society's check for $2,000 to Dr. Houston E. Couch, Head of the Dept. of Plant Pathology and Physiology, V.P.I. & S.U., and notified him that in March 1973 we expect to send $1,000 to complete the amount pledged for the first year.

This Business of Ours

Reflections on the Problems of Nurserymen

E. Sam Hemming

English Boxwood Culture

I have been familiar with the growing of English boxwoods for 50 years (42 years actively), and if a professional plantsman ever becomes an expert in the culture of any plant, I could claim this one. If I am not an expert, at least I am certainly aware of a number of subtle factors in its behavior.

English boxwood (*Buxus semervirens suffruticosa*) is a handsome, broad-leaved evergreen with qualities not duplicated in any other evergreen. As a very young plant, it is useful as a formal or informal edging plant. As a medium-sized plant, it has many uses in the landscape. As a mature plant, it makes a beautiful, billowy evergreen that seems to be almost immortal.

This plant was once very popular, but during that period, it was misplanted, abused and ignored once it was planted. When the boxwood fad died out, attention was turned to other plants. Nevertheless, there is still a respectable demand for it.

Boxwood Restrictions

The first consideration in choosing a boxwood is to realize that it can be grown only in a restricted climatic range and under certain environmental conditions. In the United States, it thrives best in a triangular area from Wilmington, Delaware, to Georgia and west to New Orleans. Eastern Maryland and Virginia are, perhaps, the most ideal locations.

The plant prefers a temperature range of 15 to 90 degrees, with a relative humidity in the moist range. It doesn't like a dry northwest wind in winter, but if given wind protection, it will stand temperatures to zero.

It doesn't like 90 to 100-degree temperatures in summer unless protected by light shade and/or generous watering.

English boxwood is one of the few plants that, when growing exuberantly, must have some of their foliage plucked or thinned out. If this is not done, the plant will accumulate a dense mass of dead leaves near the trunk (a haven for secondary disease) and too much leaf surface to withstand a drought.

Boxwood prefers a sandy loam soil; and while it likes water, it can have too much — just as it can have too much humidity. A customer once sprayed his plants with an antidesiccant during winter, and they held so much water that the foliage split from freezing.

A large plant will need careful watering for at least five years if it is transplanted. These same large plants should be given a windscreen in winter, and, perhaps, light shade in summer.

One often sees an old plant growing right next to a large tree, but it is extremely difficult to establish in such a position. A plant growing in fairly heavy shade will have just a few pronged, coarse roots, and such a plant will rarely transplant. A normal plant has a great mass of fibrous roots.

The ailments of boxwoods over the years, like hypochondria in humans, have run in fads. Some 20 years ago, canker (or wilt) was "in." This manifested itself with black lesions on twigs, masses of pink spores on dead leaves and whole branches dying out. Treatment was to break out twigs to let air in, to spray with bordeaux and fertilize.

Then came a period when certain professionals blamed all dying of of boxwoods on nematodes. I can't deny that I went out to the nursery and dug up yellow, small plants, brought pieces of root under the microscope and found little wriggling nematodes, but, invariably, this can be cured by fertilizing or transplanting the plants. The nematodes seem to be associated with certain soils and other conditions.

About a decade ago, for a three- or four-year period, whenever people called me and asked me what was wrong with their boxwood, I would visit them — sure of what I would open up the branches and show the people areas with the bark split away and with some twigs half-healed. This occurred one winter during a very cold, humid period.

In recent years, there has been much talk of boxwood decline, which is another name for old plants' fading out. It has been almost impossible for any of the scientists to pin it down to a specific pest-nematode, fungus or insect. As much as anything, I have the feeling the plants fail because one or more ofi the elements required by boxwood gets out of balance. Any of a number of things could be the real cause — plants may have used up unknown factors in the soil, creating a situation that they cannot quite tolerate.

Yet boxwoods, under certain optimum conditions, do last a very long time. Although there

seem to be records of plantings a century or more ago, it might be difficult to say whether those recorded as being planted there more than 200 years ago are the same ones.

As slow as they seem to grow, I recall that little two- to four-inch plants placed around our local courthouse in 1925 are now six- to seven-foot plants (some of which have been transplanted twice since then to allow for growth).

There are almost no insect pests of consequence on English boxwoods, and only four that I've ever seen on them: Red spider, a treatable pest; psyllid, a sucking insect that makes a leaf cup shaped; box leaf miner, a pest which migrates from adjoining susceptible plants like tree box, and a certain type of beetle that I once saw chewing a plant. I have not seen this beetle since.

Wherever English boxwood can be grown, it should be grown and used in our landscapes, for there is really no good substitute for it.

Eastern Shore Nurseries Inc.

Easton, Maryland 21601

Reprinted from the April 15, 1972 issue of the American Nurseryman, with permission from that publication, and from the author.

DR. SKINNER RECEIVES HIGHEST AWARD OF AMERICAN HORTICULTURAL SOCIETY

Dr. Henry T. Skinner, head of the National Arboretum in Washington, D. C., one of the Directors of the American Boxwood Society, has been awarded the Liberty Hyde Bailey Medal by the American Horticultural Society. This presentation was made by the Society at its 27th Annual Congress in Seattle, Washington, on September 8th. This medal is one of the highest honors given in the field of American Horticulture.

The award went to Dr. Skinner in recognition of "his role in building the arboretum into a place of national and international prominence in the plant world."

Dr. Skinner, a graduate of the Royal Horticultural Society Garden at Wisley, England, earned his doctorate at Cornell University, Ithaca, New York. He then became Director of the Morris Arboretum of the University of Pennsylvania; and came to the National Arboretum as Director in 1952, succeeding B. Y. Morrison, who retired.

Under Dr. Skinner's guiding hand, the Arboretum has become one of Washington's major attractions for visitors and area residents. It contains more than 20,000 plants in 8,000 varieties, including outstanding collections of holly, magnolia, viburnum, pyracantha, camellia, crab apple and azalea, also 200 to 300 cultivars each of daffodils, peonies, daylilies and - boxwood.

The Arboretum is open to the public without charge for admission.

NEW MEMBERS

(Added since July 1972)

Batchelder, Mrs. Philip, 106 Greenwood Avenue, Rumford, R. I.

Callaway, Mrs. Fuller E., Jr. 1200 Vernon Road, La Grange, Ga.

Clark, Mrs. Stephen C. Jr., Boxwood Farm, Middleburg, Va.

Green, Holcombe T. Jr., 3655 Tuxedo Road, N.W., Atlanta, Ga.

Himes, William E., P. O. Box 913, Middleburg, Virginia

Hurley, Richard D., 935 Curtis Avenue, West Belmar, N. J.

Lindsay, Mrs. Charles R., Route 4, Box 153, St. Charles, Ill.

Miller, Dr. and Mrs. Ira, 6800 Selkirk Drive, Bethesda, Md.

Mills, Mrs. Hunton, 1403 Oak Hill Avenue, Hagerstown, Md.

Ohrstrom, Mrs. Richard, Catesby Gardens, Middleburg, Va.

Pool, Mrs. W. H., Box 417, Warrenton, Va.

Robinson, Mrs. J. Kenneth, Merriman's Lane, Winchester, Va.

Shea, Mrs. Vincent, 4 Ivy Lane, Charlottesville, Va.

Stengle, Dr. James M., 9301 Parkhill Terrace, Bethesda, Md.

Torppa, Donald P., P. O. Box 1008, Mooresville, N.C.

Welsh, Miss France G., 95 Whitlock Avenue, Marietta, Ga.

Wills, Dr. Wirt H., Dept. Plant Pathology & Physiology, V. P. I. & S. U., Blacksburg, Va.

Young, Mr. and Mrs. R. Bruce, Jarrettsville, Md.

The Major Boxwood Diseases in Virginia

by

*R. C. Lambe and George B. Montgomery**

FIGURE 1. Healthy American boxwood on left and diseased plant on the right.

The decline and death of both English and American boxwood has been considered in previous extension bulletins as the result as the result of infection by a single plant pathogen (1). In reality, based on numerous plant isolation, recently completed, the problem is more complex. There is a high probability that frequently at least 2 or more diseases occur simultaneously on the plant to kill it. This may be the explanation for inability in the past to control certain diseases with chemicals. There is experimental evidence available now that suggests the boxwood are predisposed to infection by fungus leaf spots, stem blights, and root rots. Poorly drained soils as the result of hard pans, or planting sites near building foundations under down spouts contribute to the development of the water mold disease, Phytophthora root rot. Improperly thinned plants with tight centers are unually more subject to leaf spots and stem blights because of high humidity and low light intensity. Nematodes feeding on the roots weaken the foliage and stems.

General Practices for the Prevention of Diseases

It is possible to prevent most diseases but impossible to eradicate any. If cuttings are propagated from diseased stock plants, or the rooting media used in propagation are infested with plant pathogens, stem and root diseases may develop. Boxwood plantings should never be made in fields previously planted to boxweed where root disease has occurred unless the soil is fumigated. If pathogen-free rooting media like Weblite, perlite or vermiculite are used and the cuttings protected with fungicides, healthy plants will be produced. Treatment of previously used pots, flats and benches with steam or antiseptic chemicals, will eliminate plant disease pathogens. Fumigation of nursery fields with broad spectrum fumigants like methyl bromide or chloropicrin, before planting will eradicate nematodes and disease causing fungi from the soil. Refer to the Virginia Cooperative Extension leaflet, Control Series 105 for chemicals, concentrations and methods of application (3). This leaflet can be obtained from any Virginia Cooperative Extension office in your county.

**Extension Specialist, Plant Pathology and Graduate Student, Plant Pathology, Department of Plant Pathology and Physiology, Virginia Polytechnic Institute and State University, Blacksburg,*

Phytophthora Root Rot

The symptoms of this disease in nature caused by the fungus *Phytophthora parasitica* have been described by D. K. Bell and F. A. Haasis (2). These symptoms are poor growth and foliage which loses its normal green color and slowly changes to a light pale green, ultimately becoming light yellow. However, those plants that are heavily shaded my become dry and crisp but will retain most of their normal green color. Leaves turn upward and lateral leaf margins roll inward, suggesting drought. Symptoms may appear on just a few branches or on the entire plant, depending on the extent of fungus infection of the roots. Often the bark at the base of the infected plants dies and may be easily separated from the wood. When the roots are examined, many are dark in color and they are few in number. The lack of functioning roots is the result of fungus decay and preceedes the yellowing and death of the top (Figure 1).

Prevention

Excessive waterlogging of soils following heavy rains in the summer, or over-watering, especially where sub-soil drainage is poor, creates favorable conditions for fungus infection. The abundant moisture allows Phytophthora to move in the soil, infecting new roots or adjacent plants.

New plantings should always be made with healthy appearing plants in well-drained soil preferably where boxwood has never been planted before. If necessary to replant in a site where a boxwood has died, remove the dead plant, and as much of the diseased root system and soil from the hole as feasible. Boxwood nurseries should be established in well-drained fields previously treated with a broad spectrum fumigant.

There is no proven chemical control at present that can be recommended for use on diseased plants. Pruning to remove dead limbs and fertilization according to the VPI & SU Cooperative Extension Publication (1). Trials are in progress with chemicals like Dexon and Truban, fungicides that are registered for use on other woody plants.

Macrophoma Leaf Spot

Both English and American boxwood are susceptible to the disease called leaf spot caused by the fungus *Macrophoma candollei*. On yellow, diseased leaves there are many tiny black raised spots *(Figure 2)*. These spots are the fruiting bodies of the fungus. Usually the fungus infects plants that have been weakened by root and stem diseases, nematode infection or improper soil-moisture relations. The disease frequently appears on leaves that have suffered winter injury. Usually distribution of the disease throughout a boxwood plant indicates low vigor. Considerable defoliation can result, although some spotted leaves will persist on the plant for a long time.

Prevention

Remove all fallen and diseased leaves from the center of the plant and the soil surface and compost or burn to reduce the fungus spore inoculum. All dead branches should be cut off and removed from the vicinity of the plant.

Volutella Stem Blight

For several years, the role of the fungus *Volutella buxi* in the decline of boxwood has been open to question. Volutella is the asexual stage of Pseudonectria rousseliana. Some plant pathologists have reported that Volutella is the immediate cause of wilting and death of some plants and parts of plants in Northern Virginia.

Both English and American boxwood have been found to show symptoms of Volutella stem blight disease.

In the spring before new growth appears, the leaves on the tips of twigs turn red to bronze and yellow. Leaf yellowing is accompanied by death of the twigs. At various distances below the tip of affected twigs, the stem is girdled. A dark brown to black canker is easily discernable by cutting the cortex with a sharp knife. No chemical control measures for this disease are known at present. Diseased stems should be cut out and removed from the vicinity of the plant.

The Volutella fungus colonizes the diseased stems and it produces numerous sporodochia or pustules of colorless conidia. These appear pink in mass and are found on the stem surface.

FIGURE 2. Macrophoma leaf spot (note small black fruiting bodies on yellow leaves).

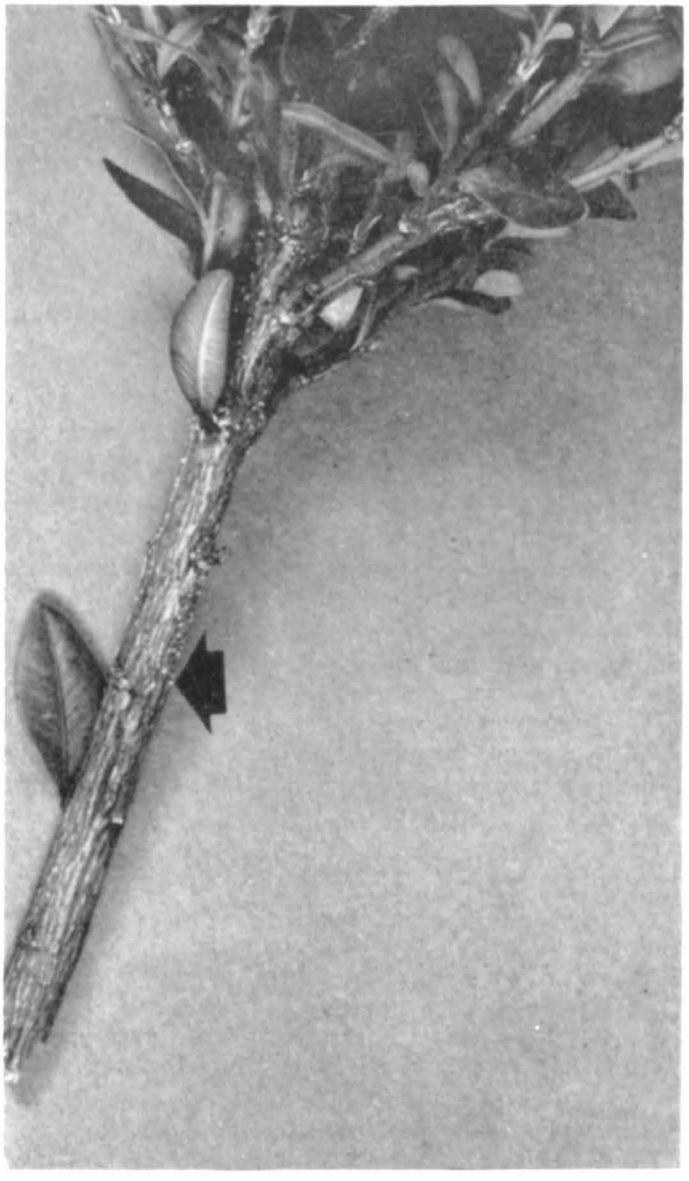

FIGURE 3. Volutella stem blight (note small pink pustules on stem).

Literature Citation

1. Beecher, A. S. et. al. 1969. Boxwood in the Landscape, Publication 246. Virginia Cooperative Ext. Service, VPI & SU, Blacksburg, Va. 24061. Couch, H. B. et. al. 1972.

2. Bell, D. K. and F. A. Haasis. 1967. Etiology and Epiphytology of Root-Rot, Stem Necrosis, and Foliage Blight of Boxwood. Technical Bull. No. 177, North Carolina State University, Raleigh, N. C.

3. Osborne, W. W. 1972. Control of Nematodes in Nurseries, Control Series 105, Virginia Cooperative Extension Service, VPI & SU, Blacksburg, Va. 24061.

The French and the English Parts of the Garden

"The Porter's Son:" *Hans Christian Andersen* (1805 - 1875_

"But the first ball was not the last, and Emily could not stand it: it was a good thing, therefore, that summer brought with it rest, and exercise in the open air. The family had been invited by the old Count to visit him at his castle. That was a castle with a garden that was worth seeing.

Part of this garden was laid out quite in the style of the old days, with stiff green hedges; you walked as if between green walls with peep-holes in them. Box trees and yew trees stood there trimmed into the form of stars and pyramids, and water sprang from fountains in large grottoes lined with shells. All around stood figures of the most beautiful stone — that could be seen in their clothes as well as in their faces; every flower-bed had a different shape, and represented a fish, or a coat of arms, or a monogram. That was the French part of the garden; and from this part the visitor came into what appeared like the green, fresh forest, where the trees might grow as they chose, and accordingly they were great and glorious. The grass was green, and beautiful to walk on, and it was regularly cut, and rolled, and swept, and tended. That was the English part of the garden.

" 'Old time and new time' said the Count, 'here they run well into one another.' "

HOW TO COLLECT AND SHIP BOXWOOD PLANTS FOR DISEASE IDENTIFICATION

The accurate diagnosis of a boxwood disease depends upon receiving a fresh sample. All specimens should be fresh when collected, and shipped immediately. When specimens arrive unidentified, wilted, crushed, or in advanced stages of decay, diagnosis is often impossible. If the sample is in good condition, the disease can be diagnosed more rapidly. Most specimens will be diagnosed and acknowledged within a week.

COLLECTING SPECIMENS

1. For small plants (12" - 18" tall), collect the whole diseased plant, including roots, and at least one quart of moist soil. Dig (don't pull) plants with a shovel or trowel.

2. Collect more than one plant if various stages of decline are evident. Dead or dry plant material is of no value. When possible, include healthy plants or plant parts for comparison.

PACKAGING PLANT SPECIMENS

1. Immediately after digging small plants, place the moist root ball in a plastic bag and tie the top of the bag around the stem just above the soil line. This will prevent the soil from drying during transit. Enclose the tops of the plants in a ventilated plastic bag. Do not wet the tops before packaging.

2. When distinct spots on the leaves are the only symptoms, include several leaves wrapped between dry strips of cardboard or in a thin magazine. Do not wrap leaves in wet paper towels. However, enclose a wet paper towel in the plastic sack.

3. Specimens should be packed in a sturdy container to prevent damage in transit. Avoid exposure to high temperatures. Whenever possible avoid weekend lay-overs in the post office.

4. Complete Plant Disease information, in an envelope, should be attached to the outside of the shipping container (see below). Include the return address both inside and outside the envelope.

5. Samples collected for insect identification should be sent to:

Extension Entomologist,
Price Hall, V.P.I. & S.U.
Blacksburg, Va. 24061

6. Samples for plant disease diagnosis should be sent to:

The Plant Protection Clinic,
Dept. of Plant Pathology & Physiology,
Room 106, Price Hall, V.P.I. & S.U.,
Blacksburg, Va. 24061

PLANT DISEASE INFORMATION REQUESTED

The plant disease information requested in (4) above, should include as many of the following items as possible, for accurate disease diagnosis.

Plant (or crop) diseased _____ Variety or species
Owner or grower _____ Address
Sender _____ Title
Address _____ Title

Year planted _____ Approximate age and size
Relation to roadside, feet _____
Present disease and insect control programs
General appearance of plants — Wilted__, yellowed__, stunted__; abnormal leaf or stem growth __;leaf spot or blight__; leaf mottle__; other . . .

Distribution of disease: Scattered plants__; groups of plants__; on slopes__; low areas__; upland areas . . .
When were symptoms first noticed?
Weather conditions of previous week?

Chemicals applied and rates, during the current growing season and previous year.
Fertilizer _____Insecticide
Fungicide _____Nematicide
Herbicide _____
When was last soil test taken_____pH of soil if known

The above abridgement of Form 97, V.P.I. & S.U. Extension Service was made by Dr. R. C. Lambe, and is intended as a guide for preparation of needed information to accompany samples of diseased boxwood sent to the Plant Protection Clinic. It is modified to apply particularly to boxwood. The complete Form 97 may be obtained by request from the Plant Protection Clinic at the address given above.

Boxwood Insect and Mite Pests

John A. Weidhaas, Jr.

Extension Entomologist V. P. I.

There are four major pests which are common on boxwood: the boxwood leafminer, the boxwood psyllid, the boxwood mite, and the boxwood webworm. Several minor pests have been reported in Virginia and occasionally may be serious in local situations: Japanese wax scale, oystershell scale, cottony maple scale, cottony cushion scale, peony scale, comstock and grape mealybugs, euonymus scale, and the bifasciculate scale.

Boxwood plants frequently are infested with some or all of the major pests at the same time. Certain boxwood species or varieties may be more or less susceptible to the pests than others.

Boxwood Leafminer

Most varieties of *Buxus sempervirens* are highly susceptible as well as *B. microphylla* var. *Japonica*. English boxwood, *B. suffruticosa* apparently is immune. Damage is caused by larvae or maggots mining in the leaves. Infested leaves appeared blistered from late summer through the following springs. New leaves do not show signs of mining until late summer when larvae are larger. A dozen or more larvae may occur in a single leaf. By fall premature leaf-drop may result from severe infestation.

Larvae first occur in the leaves in early June. They hatch from eggs laid by adults 3-4 weeks previously during late April and early May. During the period when new leaves form, eggs are laid, and mines are produced, the only evidence of infestation are egg-laying punctures on the undersides of the leaves. They appear as tiny blister spots. One generation occurs in a single season. dults are active befort and after the first of May. Eggs are present from then until early June. Larvae feed in the leaves from June until fall and spend the winter in the leaves. They pupate in April.

Control measures should be applied when larvae have just hatched and before damage occurs. Insecticides will kill larvae if applied as late as mid-August, but damage will result. Spraying once in mid-June with the systemic insecticide, dimethoate (Cygon or DeFend), gives excellent control. Diazinon is also effective when miners are present. Either insecticide should be mixed at the rate of 2 teaspoons per gallon of water, or 1 quart per 100 gallons, of 2 E formulation.

Boxwood Psyllid

Psyllids are sucking insects which as adults look like miniature cicadas. They are also called jumping plant lice since their specialized hind legs enable them to spring into the air to take flight. Plants injured by boxwood psyllids show conspicuous cupping of the foliage. The damage does not seriously impair the health of the plant unless severe infestations persist over a period of years.

The boxwood psyllid overwinters as a nymph within the egg shell. Eggs are inserted between the bud scales by adults during July and early August. Embryonic development takes place between then and fall. The nymphs emerge in mid-to-late April as soon as the buds begin to open. They feed on the new tender growth causing shoots and leaves to become deformed. Nymphs are green and soon produce white waxy secretions. They remain clustered within cupped leaves until early June when adults first appear. The adults look like large leafhoppers and are active flyers. One generation occurs each year.

American boxwood is the prime host. Occasionally English holly plants exhibit cupped foliage, but populations of the psyllid seldom are severe.

Effective control of psyllids can be achieved by some cupping of foliage will occur since nymphs begin feeding on new growth immediately after emergence. Control measures should be applied as soon as new growth appears. Sprays later will kill the insects, but with little reduction in leaf cupping. Either dimethoate (Cygon or DeFend) or oxydemeton-methyl (Meta-Systox-R) is effective as a systemic spray. Carbaryl (Sevin), diazinon, and malathion also are effective, but a wetting agent or a spreader-sticker must be added to achieve good control. Follow the dilution rate given on the label for mixing sprays. Be sure to follow all of the precautions provided on the label.

Boxwood Webworm

An inconspicuous insect, the boxwood webworm is confined to the inner parts of very dense plants. It occurs chiefly on English boxwood. The larvae spin loose webs along the stems and twigs, feeding on the innermost leaves. They have never been observed feeding on external foliage. Since many spiders inhabit the interior portions of boxwoods, the presence of webbing may be confusing. Webworm can be distinguished from spiders since fecal pellets or droppings along with partially chewed brown leaves are scattered through webbing of the insect along twigs. Larvae are grayish and up to ½" long in late spring. Larvae are difficult to see when smaller, but provide positive diagnosis of boxwood webworm.

The winter is spent on the plant as partially grown larvae. They transform to adults during May and June when egg-laying occurs. Small larvae or catterpillars are present during July and August. There is one generation each year.

No control tests have yet been conducted for this pest. On a trial basis malathion, diazinon, or carbaryl may be effective if applied during July or August when larvae are small. Sprays should be directed into the interior parts of the plants in a thorough drenching.

Boxwood Mite

Several species of mite are known to feed on boxwood but the most injurious and common is the boxwood mite. American boxwood is most frequently damaged. The foliage becomes severely stipled with pinpoint sized flecks. In severe cases all of the foliage may appear gray, bronzed, or chlorotic.

Mites overwinter as round, greenish, flat-topped eggs on the undersides of the leaves. They hatch in May and complete a generation in 2-3 weeks. Several generations occur each year, accounting for rapid build-up of populations and extensive damage. It is important to apply control measures early in the season, preferably in early to mid-May. However, miticides are effective if sprayed whenever the mites are found.

Scale Insects

A number of different scale insects attack boxwood. They are not as common or widespread as other boxwood pests, but locally can build up to cause severe damage. In Virginia the following scales have been found on boxwood: Japanese wax scale, oystershell scale, peony scale, euonymus scale, cottony maple scale, cottony cushion scale, the bifasciculate scale, and two mealybugs, the grape mealybug and the Comstock mealybug.

The Japanese wax scale attacks nearly 100 kinds of plants. It is about 1/3" in diameter when mature including the very thick, bright white waxy covering. Eggs are laid beginning in April and hatch between June 3 and June 21 depending on geographic location. Young scales develop to mature females by fall, resulting in one generation each year. The scale can be controlled effectively by spraying infested plants with carbaryl in early June when eggs begin to hatch.

The other species of scale insects are occasional pests and not usually destructive. Control is achieved by applying a drenching spray of malathion at the time when crawlers are active: oystershell scale, about the first of June; peony scale, about the fifth of june; and euonymus scale, about May 10 to 15.

WEED CONTROL

William A. Grey

WEEDS Our soils and climate encourage a rapid growth of vegetation. All plants are in some way useful and beneficial: if land is kept free of vegetation, organic matter decreases and the soil structure deteriorates. The basic principle in weed control should be to encourage desirable plants in the proper place; any plant that is out of control and out of place is a weed.

TILLAGE The fine-textured silty clay loams of this area are difficult to till, and continuous cultivation eventually degrades the soil as a growing medium. Because many trees and shrubs, including Boxwood, establish a network of fine feeder roots near the surface, cultivation can harm the plant itself. Although frequent cultivation has been a traditional method of weed control, it is generally undesirable in this region and definitely is not a recommended practice around Boxwood.

MULCH AND TURF As an alternative, the use of mulch and turf cover is now becoming more widely accepted for weed control around trees and shrubs. This technique aids immediately in water conservation, erosion problems, and topsoil temperature moderation. Over a period of time, soil structure and fertility are improved. Generally, less labor is required than for cultivation.

MULCH A thin layer (one inch or less) of coarse organic mulch covering the root area retards the growth of weedy plants near the Boxwood and makes grass mowing an easier job. Available mulch materials that stay in place well include pine bark, wood chips, and shredded sugar cane. Mulching should not be overdone. Avoid too thick a layer, since this can lead to troubles with Boxwood; one annual application, in early spring, should be sufficient.

TURF Almost any grass will make a good turf for this purpose, but presumably turf in the landscape plan normally will be lawn grasses and, in this area, preferably cool-weather species. With weed control and soil improvement as objectives, this grassy turf should be thickly planted, healthy, and mowed on the high side. Grass can be grown right up to the Boxwood planting without danger; an established English Boxwood competes successfully for water and nutrients.

FERTILIZING When trees and shrubs are in a mulch and turf cover, it is wise to think in terms of fertilizing the soil rather than individual plants. For lawns consisting of cool-weather grasses, a single feeding, in the fall, is now the recommended practice. For the turf area around Boxwood (and many other ornamentals) it is safer to make this annual feeding during late winter or early spring. On established Boxwood and lawns in average soils, broadcasting granular 10-10-10 fertilizer at a rate of about one quart (two pounds) per hundred square feet in March should be adequate.

First International Jojoba Conference

University of Arizona

TUCSON, ARIZONA JUNE 1-3, 1972

SUMMARIZING REMARKS GIVEN BY NOEL D. VIETMEYER

To sumarize the meeting and our current knowledge, I believe:

1. The meeting's overall spirit is a positive one, supportive of the thesis that jojoba is important and it has future potential.

2. We have seen that jojoba has had a checkered history but that it has never yet failed because of its own inherent technical characteristics.

3. We have seen that there are some negative features to a jojoba development program; mainly a lack of sound basic scientific knowledge and the need for time consuming R&D, plus the nagging question of toxicity which is worrisome, but in my opinion, not at all likely to completely jeopardize jojoba's development.

4. We have seen that the path ahead is not a simple one, that it is fraught with many difficulties, and it is clear that coordination, good will and a spirit of cooperation between all parties involved in jojoba development is needed.

Yesterday our knowledge of jojoba's biology took a quantum leap:

Dr. Yermanos showed that male organs can be grafted onto female plants, that plants with both sexes can be found, and that jojoba has 22 pairs of chromosomes.

Dr. Cole showed us the first pictures ever of jojoba mitochondria and pointed out how important this could be for the rapid development of desirable genetic characteristics in a jojoba line.

Dr. Forti mentioned his plants that bear fruit in three years (not the 5 or 7 or 10 year previously a bug-a-boo in the literature). He described indications that jojoba under irrigation may yield two crops per year.

Dr. Crosswhite set the record straight regarding Dr. Gibson and the Boyce Thompson Arboretum's role in jojoba development. Without them we might not have been here today.

We learned that jojoba contains a proven (by the National Institutes of Health) anti-tumor agent and that though it is in small quantity it might be an economically supportive by-product.

We learned that the chemical composition of the oil produced by the upright standing plants does not vary with location and that the composition is now known with extreme accuracy.

We learned that jojoba oil can be processed and recovered using standard equipment, that enough data is now available to scale up to full size, and that the oil and alcohols come out very pure.

We learned that cold-hardiness is an important genetic trait that may have caused the downfall of several previous plantings.

We learned that Dr. Forti, using jojoba stock from the Huntington Library, has developed during the past 10 years in Israel what are probably the most productive and genetically consistent strains in the world. I believe that future work in this country should include extensive plantings of his stock and he has agreed to supply material to permit this.

We now know that three criteria for a commercial crop are favorable for jojoba. The criteria are:

1. must be productive
2. must be responsive to the artificial environments of man
3. must have a genetic versatility

It was reported yesterday that jojoba adequately meets these three criteria, at least at this incipient stage of its development.

This knowledge and much more presented at this conference was hardly dreamed of in all the years since jojoba's last quantum leap in 1958. Now let's look to the future.

ORGANIZATION

Problem A. This is an historic meeting and we must ensure that the wisdom and knowledge of jojoba presented and represented here is made available to all those who wish to join the effort to develop this plant. I believe this can best be done with

a very carefully edited monograph covering all the aspects of jojoba from the botanical sciences to the lubrication sciences. I hope that the next step will be to produce such a book. This will focus outside readers' attention on the importance of jojoba and will lay before them, as a challenge, the scope and magnitude of the tasks ahead. This book should be very carefully edited and should build the case (realistically though) for jojoba so that readers not indoctrinated with the jojoba spirit become so. It will take time.

Problem B. To develop plants or existing stands that can yield oil economically in the shortest possible period I believe that all approaches and innovations must be explored. The latest in plant genetic technology, the latest in horticulture technology, the latest in water harvesting and the best mechanical technology for harvesting wild plants should all be considered and brought to bear in a coordinated, objective research & development effort between all the specialists needed.

I believe that the three-pronged approach described for the conference by Dr. Jones to be a very sound planning model to begin with.

Problem C. To keep the research and development moving in the most efficient and effective manner is still most important. Jojoba even now could repeat the cycles of the past and decline into obscurity for another decade. I propose that here and now be established a *Task Group for National and International Cooperation in the Research and Development of Jojoba;* that the Task Group include Dr. McGinnies (representing Arizona) and Dr. Yermanos (representing California) and that between them they choose a multidisciplinary panel of some 10 or so members. Dr. Perry (Australia) and Dr. Forti (Israel) should be foreign corresponding members.

The Panel's task will be:

1. To communicate R&D efforts so as to avoid unnecessary duplication

2. To improve communication and cross fertilization between all of the disciplines involved (botany, agronomy, soil science, hydrology, oil seed processing, industrial utilization)

3. To produce a mimeographed newsletter (quarterly?) to keep all outside interested parties aware of advances in jojoba R&D

4. To convene an informal (semiannual?) jojoba meeting to maintain communication between the disciplines

5. To help ensure that research grant requests are not duplicative

6. To immediately write a brief state-of-the-art position paper written in nondetailed language for a nontechnical audience such as the press and the Arizona and California Congressional Delegations and for use in making research grant proposals

7. To petition for standardization of the botanical name of jojoba

8. To produce a few pages of guidance on the planting and nurturing of jojoba seeds

9. To consider a plant material bank and a jojoba information bank

This suggestion to establish the Task Group was approved by the conference. Dr. William McGinnies was nominated chairman for the first year.

RESEARCH AND DEVELOPMENT

Some of you may think we have talked a lot about research. This should not scare you. Jojoba research has a long way to go but as results come out, jojoba cultivation can continue; there is no law that says commercialization must wait until all the research is complete. As an example man is only just beginning to understand the chemistry of cement and concrete and to understand why concrete is so strong, and yet we have been using it in construction since 1830.

With this clearly in mind, I would like to point out how this conference has brought to light principles and areas for jojoba Research and Development.

Two general principles that are important are:

1. One-shot experiments usually do more harm than good. There are multiple ways for processing jojoba oil into end products, multiple ways of using the end products; first choices are uneducated choices and run a very high risk of producing an unjustified negative result. Research and Development efforts must be well founded, well funded and well supplied with material. They must be competently conducted without haste. Futhermore, the results must be public knowledge and open for refereeing and scrutiny by the technical community. We can see some mistakes in this area in the older work where tons of oil were shipped from Superior to industrial users, yet we still know little of their results.

2. Jojoba development will be spurred if a unique product can be found — one that has no substute. The uniqueness of jojoba as a sperm oil substitute may no longer be enough.

The solid, hydrogenated wax may actually be the jojoba product to begin with!

SOME RESEARCH TOPICS THAT HAVE BEEN SUGGESTED

1. *Agronomy*

a. Field studies to analyse, as Dr. Jones said, "the results of experiments that have been underway for thousands of years." To find germ plasm and environmental relations in the desert.

b. To get plants with high productivity (Dr. Forti believes they are still not productive enough to be a cultivate)

c. To get more uniform genetic material

d. To manipulate natural stands to make them more productive

e. To develop plants that consistently produce seed clusters

f. To develop jojoba strains suitable for ornamental purposes

g. To identify the sex of a seed *before* it is planted

h. To further develop hermaphroditic plants and to incorporate this genetic trait into existing high yield strains

i. To further develop the grafting of male stems to female bushes and to determine if their pollen remains viable

j. Response of jojoba to fertilization and herbicides

k. Harvesting the seed economically

l. Pruning

2. *Utilization*

a. Use as a cosmetic especially a therapeutic cosmetic for acne

b. To finalize questions of oil and meal toxicity to nonruminants and ruminants, also detoxification

c. To obtain FDA approval for using jojoba in animal feeds, cosmetics, and foods too

d. Extensive, long term R&D into the multitude of industrial uses for jojoba

e. Reinvestigation of the effects of jojoba on *Tubercle bacillus, Bacillus leprae* and the Brucellosis bacilli

f. The use of jojoba oil for water evaporation control

WHAT WILL HAPPEN AS A RESULT OF THIS MEETING?

A continuing dialogue and collaboration between jojoba scientists in many disciplines will continue.

OEO and other agencies will gain even more confidence in the plant, its potential and its product. More and very extensive funds are already being discussed.

Many more of us will become "Johny Mirov Appleseeds" and with a renewed sense of dedication.

A book of the realities and promise of jojoba will be produced.

Many researchers have been and will be stimulated to renewed efforts.

It is impossible to determine precisely the effects of a meeting such as this but I very firmly believe that a decade from now we will look back on this meeting as the catalysing force that projected jojoba along the pathway leading to commercialization.

JOJOBA — A PROMISING PLANT FOR PRODUCTION OF LIQUID WAX

Jojoba (pronounced hohoba) *Simmondsia chinensis* has long been known as a valuable browse plant and has been widely planted as an ornamental. More recently it has received widespread attention because the liquid wax produced by the seeds is a possible substitute for sperm whale oil— a product derived from an endangered species.

Endemic to the Sonoran Desert of Mexico and the United States, jojoba's natural habitat comprises approximately 100,000 square miles between latitudes 25° and 31° North. There are many separate populations within this area varying from a few individuals to several hundred per acre, and some extensive populations with millions of individual plants occur (for example, in the vicinity of Superior, Arizona, and on the high desert plain of San Matias Pass in Baja California). In the Sonoran Desert, jojoba occupies elevations between 2,000 and 4,000 feet, rarely going lower but, in Baja California and in some localities in Sonora it occurs down to sea level. Jojoba is usually restricted to well-drained, coarse, desert soils and coarse mixtures of gravels and clays. In loamy to clay-loamy soils, the plant has shown ability to develop without additional water in an 8-inch annual rainfall area. Although it does occur in the desert proper, where the rainfall is less that 5" annually, its greatest dominance is where the rainfall is 15" to 18" annually.

Usually bushy, and two to six feet tall, it may grow to ten feet in stature and offers a thick cover in the desert where cover is at a premium; the natural life span appears to be over 100 years and may exceed 200 years.

The jojoba fruit is a capsule that takes about six months to mature, finally splitting open and allowing the peanut size seeds t drop out. The capsule and seed can be harvested before this happens although the total wax content may not be as high as for fully mature seeds.

Following the enactment of Endangered Species Conservation Act of 1969, sperm whales were put on the protected list and imports of sperm whale oil were banned as of December 2, 1971. Therefore a substitute must be found for the 55 million pounds of sperm whale oil annually used in the United States. Sperm whale oil is classed as a strategic commodity and is stock-piled against national emergencies. Since jojoba oil resembles sperm whale oil both in composition and in laboratory tests, it might serve well as a sperm oil replacement.

Jojoba oil has advantages over the similar product from sperm whale: it possesses no fish odor and indeed has a mild, pleasant odor; the crude oil

contains no fats and little besides the liquid wax and requires no refining for use in most industrial processes; it has a very high viscosity index and very high flash and fire points which are important industrial parameters; it will take up larger amounts of sulfur than will sperm whale oil or lard oils (about 25% more); it does not darken to the same extent as other oils on sulfurization and the highly sulfurized jojoba oil remains liquid, when highly sulfurized sperm oil requires the addition of mineral oils to do so. Perhaps jojoba oil's most important property is that it is undamaged by repeated heat-to high temperatures and does not change viscosity with temperature change.

Chemically speaking, jojoba seed oil is not a fat but a liquid wax like sperm oil. Fats, including the seed oils of most plants, are composed of a molecule of glycerine to which three molecules of various fatty acids are attached, but waxes are composed of one molesule of a long-chain alchohol to which one one molecule of fatty acid is attached.

The expression of jojoba seed yields about 45% liquid wax which requires little or no refining for use as a lubricant. The wax content of seed does not decrease with long-term storage, and has remarkable resistance to bacterial degradation. Potential uses appear almost limitless. Because jojoba oil does not become rancid, it might well replace ordinary vegetable oils where rancidity is a problem, such as in foods, cosmetics, and hair oil. The oil is also a source of long-chain alcohols, useful in the preparation of detergents and lubricants.

Hydrogenated jojoba oil is a hard white crystalline wax reportedly harder than any other wax on the market except carnauba, for which it may be an attractive substitute, as well as having use in the preparation of waxes for floors and automobiles, waxing of fruit, impregnation of paper containers, manufacture of carbon paper, candles, and many other products.

Jojoba may be direct seeded, transplanted from potted nursery stock, or grown from cuttings of new wood treated with root promoting substances. Irrigation of young plants is desirable and may be necessary to produce a good stand. Excessive irrigation especially on poorly drained soils may result in death of older plants. Shrubs will produce seeds in 3 to 5 years. As jojoba is dioecious, it is necessary to have both male and female plants in the plantation.

Jojoba tolerates the extreme daily fluctuations of temperature. In its habitat, readings of 110° and 115° F shade are usual during the summer. Mature shrubs may tolerate temperatures as low as 15° F but seedlings are sensitive to light frosts of 3° to 9° below freezing. It is drought-resistant and grows well under soil and moisture conditions not suitable for agricultural crops.

Notes from

JOJOBA HAPPENINGS,

Number 1

Arizona Harvest

The Arizona harvest started in the Tucson Mountains on a small scale with the Yaqui Indians; with an indicated picking rate so far of from two to six pounds per hour, averaging about three.

A resolution has been passed by the San Carlos Apache Tribal Council, authorizing the harvest of their natural crop. Mapping of areas with good fruiting is continuing under the leadership of Carl Tomoff, and full-scale harvest began in that area July 10. Mr. Lambert Noline, an Apache student in Business Administration at Arizona State University, has been designated harvest supervisor for the San Carlos and Superior areas; and Mr. Clint Fruitman has been appointed harvest supervisor of the southern area, which presently includes only the Tucson Mountains.

J. D. Johnson, the overall production leader for Arizona, is quite confident that the harvest will yield several tons. Carl Tomoff, who has been evaluating the seed crop in the field, declines to estimate the total potential crop except to say he thinks it may just reach the 20 to 30 ton goal.

California Harvest

According to word from Dr. Yermanos, the California seed harvest is several weeks later. It is expected that a full report of their harvest will be included in the next issue.

Mexico Production Potential

J. F. Johnson was invited to tour Mr. Hector Nenninger's land on the Gulf of California coast due west of Hermosillo, Sonora, Mexico. In the arroyos were found many jojoba plants with outstanding fruit sets. Mr. Nenninger is convinced that, on his property alone, he can provide 100 tons of jojoba seed. The stand is quite extensive and may prove to be a valuable resource. Anyone desiring further information or interested in buying seed from Mexico should contact; Hector Nenninger, Anza — 809, Hermosillo, Sonora, Mexico.

Seed Processing

Dr. Yermanos will be responsible for seed processing of both the Arizona and California harvests. The processing facility is at Colton, California, and a trial run at processing will be made as soon as several tons are collected.

Research and Development

It will be some time before jojoba liquid wax will be available for research and development projects, but it is not too early to think about preparing proposals to be acted upon when deliveries can be made.

In his summarizing statement Noel Vietmyer made a strong plea for research in the fields of agronomy, botany, soil science, hydrology, oil seed processing and industrial utilization, and suggested that the Jojoba Task Group for National and International Cooperation in the Research and development of Jojoba facilitate activities and avoid duplication. I am sure I speak for all members of the Committee now being organized, that we will all gladly do what we can to attain this goal.

Mailing List.

Jojoba Happenings No. 1 is being sent to registrants at the Jojoba Conference and to a selected list of others known to be actively interested. To build a circulation list that includes all who wish to be informed of our activities or to participate in the Task Group, we solicit your suggestions for additions to this first mailing group.

Committee Name

The Task Group for National and International Cooperation in the Research and Development of Jojoba is quite a long name and yields no suitable acronym. Anyone with an idea for a committee name and acronym should submit it to Dr. McGinnies, who will coordinate proposed names with committee members and attempt some form of democratic choice.

The chairman assumes full responsibility for all errors of omission or commission and for the name of the newsletter. If you have any critical remarks, please send them along. They will be welcome.

W. G. McGinnies, Chairman
Office of Arid Lands Studies
1201 E. Speedway
Tucson, Arizona 85719

Toxic and Tumor-Inhibiting Alkaloids of BUXUS SEMPERVIRENS

J. T. Baldwin, Jr.

Kingsbury[1] writes: "Sheep mortality from box hedge clippings has been described from Maryland.[2] Horses, pigs, cattle, and camels have been killed by box in other countries.[3] About 1½ lb. of leaves has proven lethal to horses,[4] for a toxicity of around 0.15 per cent, green-weight basis. Symptoms and lesions are those of severe gastroenteritis, sometimes with bloody diarrhea. Death occurs within a short time through respiratory failure." All references are to *Buxus sempervirens.*

In Part LV in the series entitled "Tumor Inhibitors" Kupchan[5] states: "Several of tha alkaloids isolated from *Buxus sempervirens* L. showed *in vitro* cytotoxic and in *vivo* tumor-inhibitory properties in animals," that is: poisoned cells in culture and arrested growth of tumors. It is of interest to us that Professor Kupchan is in the Department of Chemistry, University of Virginia.

We at the College of William and Mary would gladly supply material of other boxwoods than *Buxus sempervirens* for studies of poisonous alkaloids and tumor inhibitors.

1. Kingsbury, John M. *Poisonous Plants of the United States and Canada.* Prentice-Hall. 1964.

2. Reynard, G. B. and J. B. S. Norton. Poisonous Plants of Maryland in Relation to Livestock. Maryland Agr. Expt. Stat., *Tech, Bull.* A10. 1942.

3. Hurst, E. *The Poison Plants of New South Wales.* N. S. W. Poison Plants Committee, Sydney. 1942.

4. Volker, R. *Eugen Frohner's Lehrbuch der Toxikologie.* Ferdinand Enke Verlag, Stuttgart. 6th ed., 1950.

5. Swain, Tony. Ed. *Plants in the Development of Modern Medicine.* Harvard. 1972. S. Morris Kupchan. "Recent Advances in the Chemistry of Tumor Inhibitors of Plant Origin," pp. 261-278.

The second issue (October 1972) of JOJOBA HAPPENINGS, edited and published by Dr. W. G. McGinnies for the Office of Arid Lands Studies, was received by the Bulletin just in time for some parts to be included here. On the next page we reprint the entire report of the 1972 Jojoba harvest, of particular interest to Indians and their well-wishers; and on this page an item which indicates that interest in jojoba knows no boundaries.

DEVELOPMENTS IN MEXICO

Subsequent to the tour of Mr. Hector Nininger's land on the Gulf of California coast west of Hermosillo, Sonora, Mexico (see JOJOBA HAPPENINGS No. 1), we have had many requests for information from Mexican scientists and government leaders. We now produce JOJOBA HAPPEUINGS in both English and Spanish. Mr. Pedro Mahieux, an attendee of the International Jojoba Conference, has visited with us on several occasions and has recently communicated that following rather substantial August rains, the jojoba plants are again flowering and they expect a second crop. Mr. Nininger had previously stated that he had often seen more than one crop a year.

THE 1972 JOJOBA HARVEST

A total of 87,000 pounds of seed was collected, of which 10,000 pounds were collected in California and the remainder in Arizona. This weight includes not only the seed, but other material such as leaves, steems, capsuler, and bracts. After cleaning and threshing, the California clean seed weight was 2,200 pounds. No figures are available for the Arizona crop, except that on a small sample the seed was found to be between 70 and 80% of the total weight. Data are presently being assembled that will provide a good estimate of total weight loss. From the California data, it appears that considerably more weight is lost due to the moisture in the seed and hulls than was previously expected. Some early Arizona data indicated about 30% weight loss due to moisture. Newsletter No. 3 will contain a thorough discussion of this problem.

Drs. Yermanos and Johnson worked together as much as possible in determining logistics for the harvest, including establishing the pay scale. On June 15 and 16, 1972, seven Yaqui Indians harvested in the Tuscon Mountains at an hourly pay rate of $2.00 plus a bonus of 25¢ per pound. At other times, we tried payment of $1.00 per pound; and, using the blueberry rakes, 50¢ per pound. No hard conclusions could be found from this sparse data, but it did appear that pound-per-hour harvesting rate could be doubled or tripled by use of the rakes. This information was presented to the San Carlos Apache Indian Tribal Council and their Resources Committee with the clear understanding that at this stage the program was purely experimental. A resolution was passed authorizing a harvest on the San Carlos Reservation, the hiring of Lambert Noline as the Project Director, *and* the payment of $1.00 per pound.

Yermanos and Johnson thus agreed that the $1.00 per pound rate would be uniformly applied for the 1972 harvest.

The jojoba harvest in southern California started on July 11 in Joshua Tree National Monument. This was an experimental harvest using four workers for three and one-half days. It was found that the seeds were too mature and the plants too sparse to make harvesting practical in this area. Attention was focused on the Aguanga area where the jojoba population is denser and fruit matures about five to six weeks later.

The harvest in the Aguanga area started on July 24 and workers continued to harvest through the month of August. The last three weeks of August were spent concentrating on the Otay area of Southwestern San Diego County. From the Aguanga area about 8,000 pounds of seed were harvested, while the Otay area yielded only 2,000 pounds. Mr. Charles N. Riggs from the Manzanita reservation supervised the picking crews and handled weighing in and paying of each worker. One hundred and sixteen Indians from twelve reservations participated in the harvest.

The Arizona harvest, with its modest beginning in late June, really boomed on the San Carlos Reservation. Areas of minor picking included the Tucson Mountains, Lake Roosevelt, and Superior. As of July 21, the official end of Arizona's harvest, about 1,000 pounds had been harvested in the Tucson Mountains and almost 75,000 pounds at San Carlos.

San Carlos' weekly figures are:

June 30	6,111
July 7	14,318
July 14	34,693
July 21	19,619
Total	74,741

Only 24 actual days of picking were used at San Carlos, meaning that in excess of 3,000 lbs. per day were harvested. During the heaviest week of July 14, Mr. Noline issued 499 pay checks. Very rough preliminary analysis of data (Mr. Noline issued receipts showing pounds of seed, area picked from, number of people picking, and hours required) indicated about 2.4 people per paycheck, meaning that somewhat over 1,000 people were mobilized to harvest the reservation and off-reservation areas around Superior, Globe, Lake Roosevelt. All of these people were San Carlos Apache or Yavapai Prescott Indians.

One of the harvest objectives was to provide, at least temporarily, a source of income for Indians. The Arizona harvest cost a total of $94,500, of which $76,000 went toward direct harvest payments, and $4,000 toward Noline's salary and other reservation labor. Thus $80,000 or 85% of all monies went directly to the Indians. A reasonably good share of the other 15% went for scales, sacks, travel funds, and other basic logistics.

Harvest from wild shrubs presents rather anomalous problems. If harvest occurs prior to complete ripening of the seed, a considerable amount of moisture is included and the husk tends to dry into a solid casing around the seed which must be removed in a manner similar to that required for removal of the husk in peanuts. If, however, harvest is delayed until such time as most of the seeds are ripe and the husk has dried exposing the seed, hand-picked harvest is quite difficult due to the fact that a very slight agitation causes the seed to to drop to the ground. It is much more difficult to pick the seeds off the ground than to pick them directly off the bush. Futhermore, on hot, dry days, rattlesnakes enjoy the cool shade they seek in dense foliage of the jojoba plant. On the plus side, the ease with which ripened seeds fall from the bush should facilitate harvest of a cultivated crop.

Before closing this segment of the harvest section, I want to add a note of praise: Lambert Noline was truly an inspiration! Dr. Johnson gave him all the tools and authority he needed to do the central Arizona harvest, which they both expected would involve 50 to 60 people and provide a harvest of somewhere around 20,000 to 40,000 pounds by the end of August. As you know, their expectations were ridiculously low, since almost 35,000 pounds were collected in a single week. Noline, on his own initiative, solved all the logistics problems of weighing and data recording, payment and financial management, spreading, drying, sacking, and storing the crop, and the myriad of related problems. I doubt that Indians are going to have any trouble competing in the white man's economic system if Noline is an example of an inspired and trained Indian.

THE AMERICAN BOXWOOD SOCIETY

INFORMATION

DUES AND SUBSCRIPTIONS

Regular membership dues of The American Boxwood Society are now $5.00. This includes a subscription to *The Boxwood Bulletin,* to the publication of which the Society allots about 2/3 of the money received from dues.

Non-member subscriptions are for groups and institutions such as botanic gardens, libraries, etc. These are $5.00 a year, and run by the calendar year.

The Boxwood Society year runs from one Annual Meeting to the next; from May of one year to May of the next year. Those joining the Society at other times are sent all the *Boxwood Bulletin* issues for the current Society year, beginning with the July number. Their dues are then again due and payable in the following May. This was voted by the Society in order to lighten as far as possible the heavy work load of our busy Secretary-Treasurer; who, like all other officers of the Society, is an unpaid volunteer.

Price per single copy $1.25 plus 5¢ postage to members: $1.50 plus 5¢ postage to non-members. Orders of five or more copies are sent postpaid. At the present time any or all *Bulletins* are available, back to Vol. 1, No. 1 (Vol. 1 consists of three issues only, there was no Vol. 1, No. 4.)

Besides regular membership dues at $5.00 per year, there are other classes of membership available: Contributing, $10.00; Sustaining, $25.00; Life, $100.00; and Patron, $500.00.

Gift memberships are announced to the recipients by boxwood-decorated cards which carry the information that *The Boxwood Bulletin* will come as your gift four times a year.

Members of The American Boxwood Society are reminded of the 1968 IRS decision that contributions to and for the use of the Society, are deductible by donors as provided in Section 170 of the Code.

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The American Boxwood Society
Box 85, Boyce, Va. 22620

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Rear Adm. Neill Phillips, USN Ret'd., President,
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Mrs. Edgar M. Whiting, Editor,
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