plants were watered with Hoagland's solution No. 1 (4), hardened under mist for 10 days, then transferred to a greenhouse for further growth.

The cultivars produced by the above techniques were all grown to flowering. 'Roy's Yellow' grew 2 years and 'Chicago Sunrise' and 'Chicago Royal' grew 1 year before flowering. They were found to be true-to-type so far as color and pattern were concerned although some flowers were small due to the size of the plants. The propagules of all the cultivars had the pollen measured by the technique of Arisumi (1) and were found to have retained the tetraploid condition. Chen and Holden (2) and Heuser and Apps (3) have propagated the diploid *Hemerocallis* cultivars by tissue culture propagation techniques with a slightly different system, but the above techniques should also apply to propagation of diploid plants.

This tissue culture technique will result in a manyfold increase in new plants over traditional propagation methods plus it has the advantage of being nondestructive of the mother plant. This technique has the potential to reduce by several years the time to introduce a new cultivar.

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Influence of Ethephon Spray on Defoliation and Subsequent Growth on *Hydrangea macrophylla* Thunb.[1]

B. Tjia[2]
Department of Ornamental Horticulture, University of Florida, Gainesville, FL 32611
J. Buxton[2]
Department of Horticulture, University of Kentucky, Lexington, KY 40506

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Abstract. **(2-Chloroethyl)phosphonic acid (ethephon) applied as a foliar spray on field-grown *Hydrangea macrophylla* 2 weeks prior to cold storage caused defoliation within 8 to 9 days. Complete defoliation occurred at 1000 to 5000 ppm of ethephon spray on both 'Merveille' and 'Rose Supreme'. Ethephon-treated plants showed reduced height after subsequent forcing in the greenhouse. 'Merveille' was more sensitive to ethephon spray carry over than 'Rose Supreme'. Optimum concentration range for defoliation and height reduction without any visible detrimental phytotoxic symptoms was 1000 and 2000 ppm for 'Merveille' and 1000 to 3000 ppm for 'Rose Supreme'. Ethephon at 3000 ppm or higher on 'Merveille' and 5000 ppm or higher on 'Rose Supreme' induced abnormal yellow pigmentation of the flowers.**

Hydrangea are defoliated before storage to prevent the growth of *Botrytis* sp. on dead or dying leaves in storage. The prompt removal of abscised leaves from plants in cold storage is necessary to prevent infection to the plants. Intact or defoliated leaves may serve as entry points of the fungus to the stems and eventually the apical meristem. Once the apical meristem is infected, vegetative and reproductive development generally cease. A need exists therefore, for the removal of hydrangea foliage in the field prior to cold storage to prevent botrytis infection and to eliminate the labor involved in removing abscised foliage once plants are in storage.

Post (4) was one of the earlier proponents of hydrangea defoliation in storage and suggested the use of ethylene generated from senescing apples. Another method of defoliation is to place plants in complete darkness for a period of time or to use materials such as sodium azide, phenyl mercuric chloride, monosodium cyanamide, and amino triazole as foliar sprays (2) and vapors of Vapam (5). These chemicals are not used commercially on the basis of incomplete defoliation or phytotoxic effects (2). Pre-storage defoliation by foliar spraying with 2-butyne-1, 4 diol was recommended by Shanks (5). Shanks (6) also reported the pre-storage removal of leaves by a foliar spray of ethephon but that such treatment had a dwarfing effect on growth at forcing.

Ethephon has been shown to regulate defoliation on cotton and peach trees (1, 3). The objective of this study was to determine if ethephon, an ethylene-releasing compound, could be used as a defoliant on hydrangea prior to cold storage without injuring subsequent growth.

Two bud cuttings[3] of hydrangea 'Merveille' and 'Rose Supreme' were placed in the propagating beds at the horticultural greenhouses of the Univ. of Kentucky during April of 1973. Upon rooting, these were potted in 15 cm diam plastic pots containing a steam – pasteurized medium consisting of equal volume of peat, perlite, and soil, amended with 5.6 kg superphosphate and dolomitic limestone per m^3 of soil mix.

Plants were watered by a Chapin system, manually operated, and fertilized at each watering with 200 ppm N and K. Plants were grown in the greenhouse, pinched on June 15, 1973, and then were moved to the field growing area on July 15 to harden. Fertilization was discontinued at this time.

Twelve plants of each cultivar were sprayed with ethephon at 0, 1000, 2000, 3000, 4000 and 5000 ppm on Nov. 8, 1973. Enough material was used to wet all foliage thoroughly, (20 to 25 ml of solution per plant). Plants were moved to the cold storage facilities on Nov. 23, 15 days after ethephon treatment. The soil medium was drenched with 180 ml of Benlate fungicide per pot on Nov. 20. Cold storage temp was maintained at 5°C. On Feb. 5, 1974, plants were placed in the greenhouse where forcing temp were maintained at 16–18°C, and pruned to 3 canes per pot. The treatments were then arranged in a randomized complete block design with 3 replications and 4 plants per replicate, and watered by Chapin tubes with 200 ppm of N and K at each irrigation. Each plant was given a 30 × 35 cm spacing. Height was measured

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[2]Assistant Professor.

[3]Hydrangea cuttings supplied by Rasmussen Inc., Evergreen Branch, Hubbards Lane, Louisville, KY 40207.

from pot rim to the top of the inflorescence when flowers matured. The no. of days for flowers to mature was recorded starting from Feb. 5.

A wide range of ethephon spray concn was effective in defoliating of hydrangea plants (Table 1, Fig. 1). Partial defoliation occurred within 3–4 days following application and complete defoliation within this same period occurred also when pots were lifted and shaken a few times. Formation of abscission layers as a result of ethephon spray apparently occurred rapidly since foliage was very easy to remove manually 3 to 4 days following the spray. Ethephon spray application under field conditions for commercial establishments appeared to show promise to facilitate removal of foliage while lifting pots into trays or transport vehicles. This method of foliage removal eliminates the labor of picking abscised leaves in storage as is now practiced commercially.

An added benefit of ethephon spray to facilitate defoliation of hydrangea is the growth retarding effect following the cold storage period (Table 1). No phytotoxic side effects were observed if ethephon were applied at concn below 5000 ppm on 'Rose Supreme' and 3000 ppm on 'Merveille'. Concn exceeding 3000 and 5000 ppm on these cvs. respectively caused pronounced expression of an abnormal yellow pigmentation on flowers. Flowers were creamy to yellowish instead of the normal pink or blue color. Concn of 5000 ppm or higher on 'Merveille' aborted some flower buds and caused development of multiple vegetative branches at the base of the stems. 'Rose Supreme' appeared to be less sensitive, as none of the flower buds aborted at the 5000 ppm concn. Flowers, however, became gradually smaller and were cream colored also. From this exploratory test, it was found the best concn of ethephon spray to defoliate hydrangea were in the range of 1000 to 2000 ppm for 'Merveille' and 1000 to 3000 ppm for 'Rose Supreme'. An added advantage of ethephon spray on hydrangea prior to storage was its growth retarding effect upon subsequent forcing performance. Treated plants were more compact and smaller in size.

Table 1. Effect of ethephon spray on defoliation and subsequent growth and flowering of *Hydrangea macrophylla*.

Ethephon concn (ppm)	Start of leafdrop (days)[z]	Ht of flowering (cm)	Flowering time (days)
	Rose Supreme		
Control	–	63.5a	93a
1000	8a	58.3b	97a
2000	9a	54.5c	95a
3000	8a	51.2d	95a
4000	9a	51.3dc	95a
5000	8a	40.3e	93a
	Merveille		
Control	–	36.1a	87a
1000	8a	25.0b	85a
2000	8a	21.6bc	86a
3000	9a	19.6c	86a
4000	10a	19.6c	85a
5000	9a	18.8c	85a

[z]Mean separation within each column, by Duncan's multiple range test, 5% level.

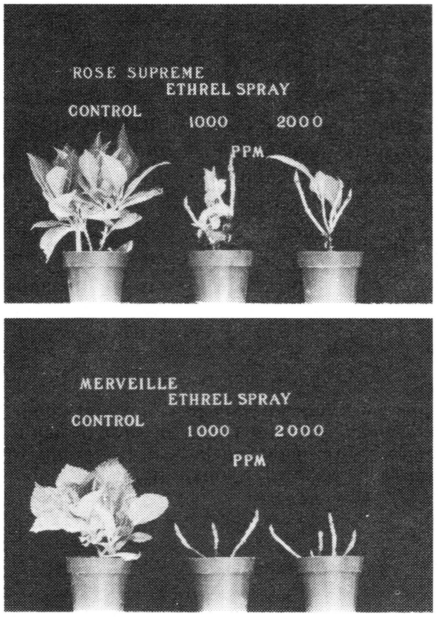

Fig. 1. Effect of ethephon spray on defoliation of 'Merveille' and 'Rose Supreme' hydrangea photographed 8 days after treatment.

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Ineffectiveness of Commercial Microorganism Inoculum in Breaking Down Thatch in Common Bermudagrass in Hawaii[1]

C. L. Murdoch[2]

Department of Horticulture, University of Hawaii, Honolulu, HI 96822

J. P. Barr[3]

Occidental Chemicals Hawaii, Inc., Honolulu, HI 96819

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Abstract. **Commercial microorganism inoculum was tested for effectiveness in aiding thatch breakdown in common bermudagrass (*Cynodon dactylon* (L.) Pers.) turf on two golf courses in Hawaii. None of the materials tested were effective in reducing thatch accumulation over a 5-month test period.**

Thatch in turf is defined as a tightly intermingled layer of dead and living stems and roots that develops between the zone of green vegetation and the soil surface (1). It is composed of materials high in lignin content, e.g. vascular strands of stems, leaf sheaths, and the nodes of stems. Because of its lignin content, thatch is resistant to breakdown by soil microorganisms (3).

Thatch is undesirable because the esthetic value of the turf is reduced, water infiltration is impeded, disease incidence is increased, scalping due to mowing is increased, rooting depth is decreased, heat and cold tolerance reduced and proneness to iron chlorosis increased (1, 3, 4).

Cultural practices such as vertical mowing, aerification, and top dressing are used to control thatch (1, 2, 3, 5) but all are time consuming and temporarily detract from turf appearance and interfere with its use.

Recently commercial products have appeared which are advertised as being effective in breaking down thatch when applied to turf in small amounts. While the active constituent(s) of these materials are not listed by the manufacturers, it is implied that they contain an inoculum of microorganisms which aids in the decomposition of organic material.

[1]Received for publication January 12, 1976. Journal Series No. 1974 of the Hawaii Agricultural Experimental Station, Honolulu, HI 96822.

[2]Associate Professor of Horticulture.

[3]Technical Sales and Products Development Representative.