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35 YEARS OF SPECIALTY HORTICULTURAL RESEARCH

Beginnings

Horticultural research with nursery and ornamental crops at Oregon State University had its beginning when legislative action sponsored by the Oregon Association of Nurserymen in 1937 gave it funding. A Department of Agriculture survey at that time listed 14 industry problems having horticultural implications. The two initial projects in horticulture undertaken by Henry Hartman, John Milbrath, and Elmer Hansen covered (1) problems relating to the storage and handling of nursery stocks and (2) cultural problems of nursery stock. These early projects were responsible for much of the early work on the use of synthetic auxins in rooting cuttings, the use of refrigeration in rose storage, the time of digging and maturity studies in roses, the preservation of cut flowers and timing the balling and burlapping operations in conifers.

Defoliation Problems: Probably the most significant work accomplished during this first decade was the defoliation studies with roses and English holly. There was a need to hasten the removal of rose leaves before storage and shipment and to prevent the defoliation of cut holly in storage and transit. The role of ethylene gas in stimulating leaf abscission in these two plants was established and used in developing methods for defoliating roses before storage and in safeguarding holly from fruit emanations of ethylene gas. The hormone dip (naphthaleneacetic acid) now used for cut holly was an outgrowth of these early studies.

These results were published in three significant papers:

1. Milbrath, J. A., Elmer Hansen, and Henry Hartman. 1940. The removal of leaves from rose plants at the time of digging. Ore. St. Coll. Agric. Exp. Sta. Bul. 385.
2. Milbrath, J. A., Elmer Hansen, and Henry Hartman. 1940, Defoliation of rose plants with ethylene gas. Science 91(2352) 100.
3. Milbrath, J. A. and Henry Hartman. 1942. The cause and control of defoliation in cut holly. Ore. St. Coll. Agric. Exp. Sta. Bul. 413.

These projects during the early 1940s included studies of maturity and dormancy indices in various nursery stocks and the use of wax emulsions as antidessicants and mixtures of wood wastes (shingleton, excelsior) with peat moss as packing materials for deciduous nursery stocks.

Gladiolus: It was also during this period that Al Roberts and John Milbrath in Horticulture and Myron Cropsey in Agricultural Engineering worked with the gladiolus growers on numerous problems. The gladiolus was a major bulb crop in the state at that time. Flower removal and

time-of-digging practices were related to corm maturity, and optimum storage environments were established. Artificial drying techniques were developed to reduce disease and thus corm losses in wet seasons. A detailed study was also made of corm dormancy and techniques were developed for increasing corm stands of difficult-to-increase varieties.

Papers recording some of these findings were:

1. Roberts, A. N. Treatments for increasing the germination of gladiolus cormels. Master of Science Degree, Ore. St.Coll. 1941.
2. Roberts, A. N. and J. A. Milbrath. 1943. The influence of flower removal on gladiolus corm development. Proc.Amer. Soc. Hort, Sci. 43:319-322.

The shift of emphasis to vegetable and fruit production during the war years, 1942-46, caused a temporary interruption in ornamentals research at Oregon State. However, with the end of the war, the return of staff and the rapid expansion of the nursery industry after World War II caused a renewed interest in specialty horticultural crop research during the post-war period. The great stimulus to ornamentals research provided by the return to Oregon of the renowned botanist and horticulturist Dr. Ezra J. Kraus, after his retirement from the University of Chicago, should not be overlooked. His breeding programs with chrysanthemums, azaleas, rhododendrons, clematis, and a variety of other plants caught the imagination of researchers and garden clubbers throughout the Northwest. Selections are still being made from some of his seedlings in gardens around the state. The Department of Horticulture receives a royalty check each year for the greenhouse azalea 'Dogwood' that was selected from his seedlings. Many of his mum varieties are still in the trade. Credit should also be given to Drs. Larry Blaney and Ralph Garren for their contributions to these programs.

New Crop Development

The production of two relatively new ornamental crops expanded rapidly during the decade immediately following World War II.

Lilies: The growing of Easter and garden lilies and English holly presented many research problems for Experiment Station personnel in Horticulture, Entomology, and Plant Pathology. Many of these problems have been solved but new ones have appeared to take their place. There have been problems of nutrition, greenhouse forcing, bulb growth and development, breeding and variety testing and storage to name but a few. After 35 years, the Easter and garden lily industry is probably stronger than at any time in its history and is expanding. It is rare that a bulb industry has lasted this long in the historical centers of production, and this is a tribute to the cooperative research efforts of the departments at Oregon State, the University of California, and the USDA with the financial support of the Pacific Bulb Growers Association, the Curry County Court, and the Bulb Jobbers Association. This work is being continued at the Pacific Bulb Growers Research and Development Station. The following papers are indicative of the type of research that has been underway over the years. Many grower briefs that have appeared in the Oregon Ornamental and Nursery Digest are not listed for reasons of space.

1. Roberts, A. N., L. T. Blaney, and Ralph Garren, Jr. 1955. Summer sprouting of 'Croft' lily bulbs. Flor. Rev.. Oct. 6.

2. Blaney, L. T., D. E. Hartley, and A. N. Roberts. 1963. Preheating before precooling benefits Easter lily bulbs. *Flor. Rev.* Vol. CXXXIII (3439) October.

3. Hartley, D. E., L. T. Blaney, and A. N. Roberts. 1964. Preparing 'Ace' lily bulbs for an early Easter. *Flor. Rev.*, 134 (3473): 17-18, 80-81.

4. Blaney, L. T. and A. N. Roberts. 1966. Influence of harvest date and precooling on leaf and stem elongation in the 'Croft' Easter lily (*Lilium longiflorum* Thunb.). *Proc. Amer. Soc. Hort. Sci.* 89:651-656.

5. Blaney, L. T. and A. N. Roberts. 1966. Growth and development of the Easter lily bulbs, *Lilium longiflorum* Thunb. 'Croft.' *Proc. Amer. Soc. Hort. Sci.* 89:643-650.

6. Roberts, A. N. and L. T. Blaney. 1968. Effects of vernalization and partial defoliation on flowering and correlative relationships in *Lilium Longiflorum*, Thunb. 'Croft.' *Proc. Amer. Soc. Hort. Sci.* 92:646-664.

7. Wilkins, H. F. and A. N. Roberts. 1969. Leaf counting. a new concept in timing Easter lilies, *Minn. State Florists' Bul.* 10-13, December.

8. Wang, S. Y., A. N. Roberts, and L. T. Blaney. 1970. Relationship between length of vernalization, stem, apex size, and initiatory activity in *Lilium longiflorum* cv. 'Ace.' *Hort. Science* 5(2):113-114.

9. Lin, P. C. and A. N. Roberts. 1970. Scale function in growth and flowering of *Lilium Longiflorum*, Thunb. 'Nellie White.' *Journal Amer. Soc. Hort. Sci.* 95(5):559-561.

10. Blaney, L. T., A. N. Roberts and Peggy Pei-Chi-Lin. 1967. Timing Easter lilies by a leaf remainder method. *Flor. Rev.* May 11.

11. Wang, S. Y. and A. N. Roberts. 1970. Physiology of dormancy in *Lilium longiflorum* 'Ace,' Thunb. *Journal Amer. Soc. Hort. Sci.* 95(5):554-558.

12. De Hertogh, A. A., A. N. Roberts, et al. 1971. *A guide to terminology for the Easter lily (Lilium longiflorum Thunb.)*. *HortScience* 6(2):121-123.

13. Roberts, A. N. and F. W. Moeller. 1971. Vegetative and flowering responses of *Lilium longiflorum* Thunb. cultivars to cold and long day treatment as related to bulb maturity. *Proc. First Int. Symp. on Flower Bulbs*, Lisse, The Netherlands.

14. Roberts, A. N. and L. H. Fuchigami. 1972. New lily deflowering treatment shows promise. *Florists' Review*, October 26.



Dr. L. H. Fuchigami, who represents the new generation of ornamental horticulturists at OSU, checks results of growth-retarding chemicals on bulbs.

In addition to the work done on Easter lilies, the Fred C. Gloeckner Foundation has provided Oregon State University with two years funding for research to control the growth and development of colored Oriental hybrid lilies. This financial support along with the cooperation of Oregon and California bulb growers has enabled us to successfully determine the requirements for harvesting, floral induction and forcing of ideal pot plants of the Oriental hybrid lilies. Preliminary indications from industry suggest a promising future for the Oriental hybrid lily as pot plants. Several publications are in preparation.

Holly: Oregon State horticulturists have worked with the holly growers from the very beginning of planting orchards on their own roots. The trees were originally grown from seedlings and one of the first studies undertaken was the use of rooting compounds on English holly stem cuttings. As mentioned earlier, the problem of holly defoliation in shipment was a critical one in the early days and was solved. Other problems followed in rapid succession-pollination, nutrition, storage requirements, pruning and training, variety testing, grading and many others. Holly studies are still underway and an attempt is made to keep information current. Some of the publications that have appeared over the years:

1. Roberts, A. N. and C. A. Boller. 1947. Suggestions for growing English holly in western Oregon. Ore. St. Coll. Agric. Exp. Sta. Circ. of Info. 409.
2. Roberts, A. N. and C. A. Boller. 1948. Pollination requirements of English holly, *Ilex aquifolium*. Proc. Amer. Soc. Hort. Sci. 52:501-509. Oregon. Ore. St. Coll. Agr. Exp. Sta. UuI. 4bb (reprinted May, 1953).
3. Roberts, A. N. and C. A. Boller 1951. Holly production in Oregon. Ore. St. Col. Agric. Exp. Sta. Bul. 455 reprinted May, 1953).
4. Roberts, A. N., R. L. Ticknor, and O. C. Compton. 1961. Boron deficiency evident in Oregon holly orchards. Plant Dis. Rpt. 45(8):634-635.
5. Ticknor, R. L. and A. N. Roberts. 1968, Effects of leaf boron content on rooting of English holly cuttings. The Plant Propagator 14(1):5-8.
6. Ticknor, R. L., A. N. Roberts, and O. C. Compton. 1969. Nutrition of English holly, *Ilex aquifolium*, in Oregon. The Amer. Hort. Mag. 48(2):67-69, Spring.
7. Roberts, A. N. and R. L. Ticknor. 1970. Commercial production of English holly in the Pacific Northwest. The Amer. Hort. Mag. 49 (4):301-314.

Cultural Problems

Wood Waste Utilization: During the late 1940s and early 1950s, the first of a long line of soil management and nutrition studies was initiated. In cooperation with Drs. R. E. Stephenson in Soils and W. B. Bollen in Bacteriology, a detailed study of the utilization of sawdust and other wood wastes in soil management for horticultural crops was undertaken. A great deal of research information on the subject was accumulated during this 10-year period. In fact, some of this work is still underway in one of the federal laboratories on the OSU campus. The renewed interest in fir bark and other organic materials for container-growing of nursery stock has encouraged further research along this line at the North Willamette Station and at Corvallis.

Several papers relating to wood waste utilization have appeared over the years from this research effort:

1. Boller, C. A. and R. E. Stephenson. 1946. Some effects of mulches on soil properties. Proc. Amer. Soc. Hort. Sci. 48:37-39.
2. Roberts, A. N. and R. E. Stephenson. 1949. Sawdust and other wood wastes as mulches for horticultural crops. 40th Ann. Rpt. of Ore. St. Hort. Soc.
3. Bollen, W. B., A. N. Roberts, Elmer Hansen, and R. A. Pendleton, 1955. Effect of Organ-A, A dehydrated ammonia-base waste sulfite liquor on micro-organisms, soils, and plants. Ore. Sta. Univ. Agric. Exp. Sta, Misc. Paper 12.
4. Kirsch, R. K. 1959. Effects of sawdust mulches, I. Soil properties. Ore. St. Coll. Agric. Exp. Sta. Tech. Bul. 49.
5. Roberts, A. N. and W. M. Mellenthin. 1959, Effects of sawdust mulches, II. Horticultural Crops. Ore. St. Coll. Agric. Exp. Sta. Tech. Bul. 50.

Ornamental Plant Nutrition: From 1951-61 a number of papers were published that reflect the work done during this period on the nutrition of lilies, azaleas, junipers, geraniums, and hollies. A great deal of nutrition work on these and other ornamentals does not appear in print because it was diagnostic and consultative in nature, did not necessarily represent new information and was carried out as grower service. A great deal needs to be done on the nutrition of a wide variety of ornamentals in the Northwest, and there are indications that more effort will be placed in this direction.

1. Roberts, A. N., R. E. Stephenson, and S. E. Wadsworth. 1951. Effectiveness of lime in preventing scorch of 'Croft' lilies during forcing. Flor. Exch. and Hort. Trade World, October 27.
2. Roberts, A. N. et al. 1951. 'Croft' lilies. Effects of fertilizers on growth, bud count, and leaf "scorch." Flor. Rev., May 3.
3. Colgrove, M. S., Jr. and A. N. Roberts. 1956. Growth of the azalea as influenced by ammonium and nitrate nitrogen. Proc. Amer. Soc. Hort. Sci. 68:522-536.
4. Roberts, A. N., R. L. Ticknor, and O. C. Compton. 1961. Boron deficiency evident in Oregon holly orchards. Plant Dis. Rpt. 45(8):634-35.
5. Roberts, A. N., L. T. Blaney, and O. C. Compton. 1964. Seasonal changes of certain nutrient elements in the leaves and bulbs of 'Croft' lily, *Lilium longiflorum*, and their relation to bulb yield. Proc. Amer. Soc. Hort. Sci. 85:611-630.
6. Hartley, D. E. and R. L. Ticknor. 1964. Magnesium deficiency in juniper resembles juniper blight. Plant. Dis. Rpt. 48(7):581-584.
7. . Hartley, D. E., F. P. McWhorter, and L. T. Blaney. 1964. Effect of nutrition, and light intensity on expression of leaf breaking virus in geranium, *Pelargonium hortorum*. Proc. Amer. Soc. Hort. Sci. 85:594-598.

The 1967 Ornamentals research staff in the OSU Department of Horticulture included (from left) the late Dr. L. T. Blaney, Professor S. E. Wadsworth, graduate student David G. Adams (now area Extension specialist in Portland), and Dr. A. N. Roberts.



Graduate Research Assistance

It was during the early 1950s that the second important event occurred in the development of ornamentals research at Oregon State. Again, it was action on the part of the Oregon Association of Nurserymen that added new impetus to the program. Through their legislative action committee, the Association facilitated the collection of a research fee by the State Department of Agriculture when collecting the annual nursery license. These research fees are passed on to the departments of Entomology, Horticulture, and Botany and Plant Pathology for research on nursery and ornamental crop problems. It was decided early that these funds should be used for graduate research assistantships so that research accomplishments made possible by this source of funds could be readily identified. The first graduate student in horticulture to receive support from these funds was Melvin S. Colgrove in 1953, who did the work on azalea nutrition cited earlier. From that time on, 18 graduate students have completed advanced degrees in horticulture while working on research problems in ornamental horticulture. Of these, 15 have received part or all of their research assistantship support from the Oregon Bulb, Florist, Nursery Council (now called State Nursery Advisory Council) or the lily bulb research assistantship provided by the Legislature as a result of action taken by the Pacific Bulb Growers Association.

Dr. R. L. Ticknor, ornamentals project leader at North Willamette Experiment Station, and Dr. G. B. Wood, Experiment Station director, examine growth in shade tree evaluation plots at North Willamette.



A list of these students and their thesis titles and degrees gives a hint of their contributions to ornamentals research. More specifically, their research is evident in the long lists of research papers cited throughout this report.

1. Schaad, L. O. 1939. The use of root promoting substances in the propagation of cuttings. M.S.
2. Hammers, L. A. 1949. The pollination status of *Prunus subcordata*. M.S.
3. Hunter, D. 1950. Time of defoliation as it affects behavior of field-grown roses. M.S.
4. Clarkson, V. A. 1951. Relative toxicity of aluminum, boron, and manganese at various pH levels to 'Croft' lilies. M.S.
5. Colgrove, M. S., Jr. 1955. Growth of azalea as influenced by ammonium and nitrate nitrogen. M.S.
6. Neill, J. W. 1955. Street tree problems for the Pacific Northwest. Ph.D.
7. McNeilan, Ray A. 1958. The combined effects of nitrogen nutrition, temperature, and daylength on the growth of greenhouse azaleas. M.S.
8. Weiser, Conrad J. 1961. The physiological role of boron in the rooting of hypocotyls of *Phaseolus vulgaris* L. Ph.D.
9. Cline, Elizabeth Ann. 1962. Seed dormancy and the germination of seeds of difficult-to-germinate ornamental plants. M. S.
10. Adams, David G. 1967. A morphological approach to predicting the rooting potential of the *Rhododendron* shoot. Ph.D.
11. Larson, Jerry D. 1967. The effects of temperature, photoperiod, and growth regulators on the development of *Ajuga reptans* L, M.S.
12. Lin, Peggy Pei-chi. 1967. Studies on development and flowering of *Lilium longiflorum*, Thunb. M.S.
13. Bahadur, Ray, 1968. The substitutional relationship between precooling and long days on growth and floral induction of Easter lily, *Lilium Longiflorum*. Ph.D.
14. Hartley, David E. 1968. Growth and flowering responses of Easter lily, *Lilium Longiflorum* Thunb. to bulb storage. Ph.D.
15. Johnson, Charles Robert. 1969. The nature of flower bud influence in root regeneration in the *Rhododendron* shoot. Ph.D.
16. Wang, Shioh-Ying. 1969. Physiology of dormancy in *Lilium Longiflorum* Thunb. Ph.D.
17. Black, Darvil Kim. 1973. Influences of shoot origin and certain pre- and post-severance treatments on the rooting and growth characteristics of Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, stem cuttings. Ph.D.
18. Gray, Kim Diane. 1973. Initiation and development of *Lilium Longiflorum* Thunb. bulb scales as affected by temperature and daylength. M.S.
19. Bhella, Harbans Singh. 1974. Root initiation and elongation in Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, stem cuttings as related to bud and cambial activity, Ph.D.

Rootstock Research

Tree Fruit Rootstocks: The production and marketing of deciduous fruit trees and understocks have always been a major item in the nursery industry of the Pacific Northwest. Oregon State has been a leader in pear, apple, cherry, and prune rootstock work. This dates from Professor Frank

C. Reimer's leadership in pear rootstock research at the Southern Oregon Experiment Station and continuing until the present time. Space does not permit a complete list of all the papers published by the Oregon Experiment Station on this subject. This would include work not only in Corvallis but also at the Mid-Columbia and Southern Oregon Experiment Station. However, since much of the rootstock research with dwarfing stocks for apples and the evaluation of cherry and prune rootstocks are an outgrowth of the nursery and ornamentals research program at Corvallis, some of these papers should be listed. These reflect in part the continuing program of fruit tree rootstock research that has been going on in the Oregon Agriculture Experiment Station during this century.

1. Roberts, A. N. and L. A. Hammers. 1951. The native Pacific plum. Ore. Agric. Exp. Sta. Bul. 502. 22 pp.
2. Roberts, A. N. and Henry Hartman. 1954. Control of growth and production in apples by means of selected rootstocks. 46th Ann. Rpt. of Ore. St. Hort. Soc.
3. Roberts, A. N. 1957. Growth-controlling stocks in the orchard management picture. Wash. St. Hort. Assoc. 53:202-206.
4. Roberts, A. N., and W. M. Mellenthin. 1957. Propagating clonal rootstocks. Ore. St. Coil. Agric. Exp. Sta. Circ. of Info. 578.
5. Roberts, A. N. 1959. Tree size, number, and bearing habit determine per acre yields with growth-controlling rootstocks. Wash. St. Hort. Assoc. Proc. 55:48-51.
6. Roberts, A. N. 1962. Prune rootstocks. Ore. St. Hort. Soc. Ann. Rpt. 54:103-106.
7. Roberts, A. N. 1962. Cherry rootstocks. Ore. St. Hort. Soc. Ann. Rpt. 54:95-98.
8. Roberts, A. N. and L. T. Blaney. 1967. Qualitative, quantitative and positional aspects of interstock influence on growth and flowering of the apple. Proc. Amer. Soc. Hort. Sci. 91:39-50.
9. Chaplin, M. H., M. N. Westwood, and A. N. Roberts. 1972. Effects of rootstock on leaf element content of 'Italian' prune (*Prunus domestica* L.). Jour. Amer. Soc. Hort. Sci. 97(5):641-644.
10. Westwood, M. N., M. H. Chaplin, and A. N. Roberts. 1973. Effects of rootstock on growth, bloom, yield, maturity, and fruit quality of prune (*Prunus domestica* L.). Jour. Amer. Soc. Hort. Sci. 98(4):352-357.

Rose Rootstocks: The rose research begun by Milbrath, Hartman, and Hansen in the 1940's was continued by Roberts and Ticknor through the 1950s and 1960s. The pressing research needs of other segments of the ornamentals industry coupled with the slow decline of rose growing in Oregon and the Northwest favored a shift of research efforts to other crops. Several papers published during this period show the nature of the problems studied.

1. Roberts, A. N. 1950. Pre-storage defoliation of field-grown roses with certain chemical sprays and dust. Proc. Amer. Soc. Hort. Sci. 56:475-481.
2. Roberts, A. N. 1959. The importance of rose rootstock selection. American Rose Annual-1959, 62-67.
3. Roberts, A. N. 1962. Scion-bud failure in field-grown roses. Proc. Amer. Soc. Hort. Sci. 80:605-614.
4. Ticknor, R. L. and A. N. Roberts. 1964. Nursery performance of selected garden rose rootstocks. Proc. Int. Plant Prop. Soc. 13:205-208.

5. Ticknor, R. L. and A. N. Roberts. 1967. Bloom production on selected garden rose rootstocks. Proc. Inter. Plant Prop. Soc. 17:397-403.
6. Ticknor, R. L. 1971. Nutrition and bloom production of roses affected by rootstock. Amer. Rose Annual, 64-68.



The Pacific Bulb Growers Research and Development Station at Harbor has been the site of major production research on Easter lilies.

Ornamentals Research At North Willamette

The establishment of the North Willamette Experiment Station at the beginning of the third decade of ornamentals research in Oregon (1958) was most significant to the continued expansion of much-needed programs. Under Dr. Robert L. Ticknor's direction, the research at this station has added a new dimension to horticultural research in ornamentals. Located near the industry's center, the program has been especially effective in solving many immediate problems. During the early development of the program at North Willamette, Dr. Ticknor helped expand the rose rootstock and holly nutrition work. The program at this station has expanded to include new areas of research in rhododendron breeding and culture, containergrowing technology, landscape tree evaluations, chemical weed control in ornamentals, native plant selection, weathering trials with plastic films, pieris breeding, propagation problems, and many other studies of immediate concern and practical important to the industry. The station has also been our major testing site for numerous ornamental species.

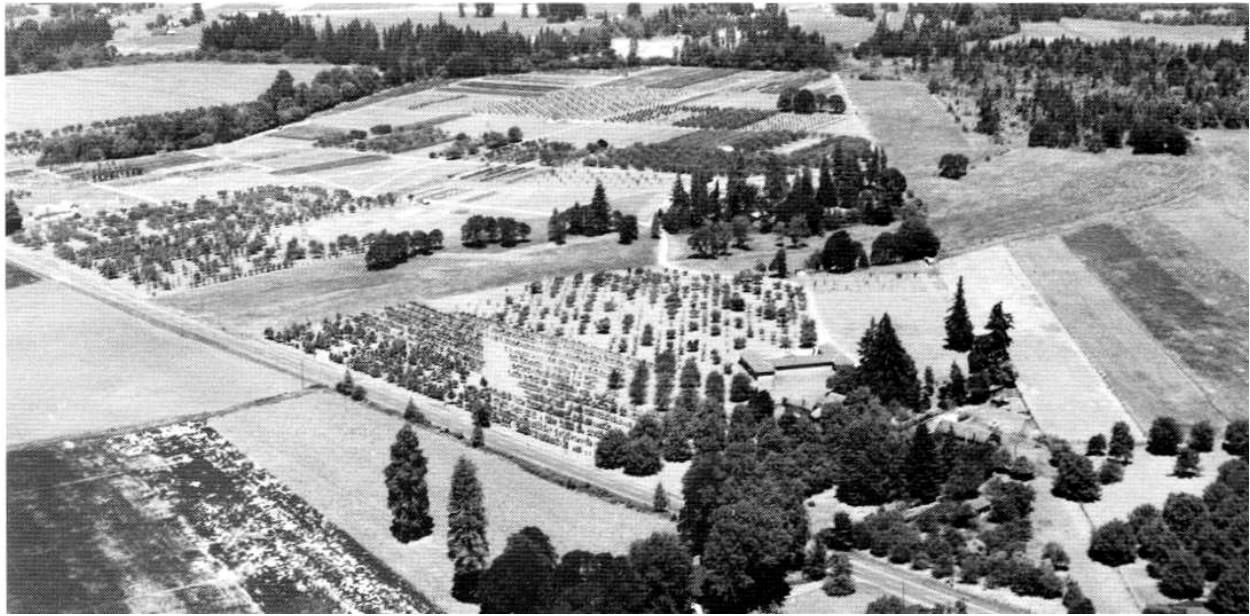
In addition to papers already cited in other sections of this report, the following papers reflect the varied research program at North Willamette and some of its results:

1. Ticknor, R. L. 1960. Ornamental and nursery crops. Proc. Ore. Weed Conf. 9:35.
2. Ticknor, R. L., et al. 1961. Progress report of research on chemical weed control in nursery crops. Ore, Agric. Exp. Sta. Misc. Paper No. 118, 23 pp.
3. Ticknor, R. L. 1962. Herbicide timing study on ornamental shrub liners. Res. Prog. Rep. West. Weed Cont, Conf. 37 pp.
4. Ticknor, R. L. 1962. Ornamental and nursery weed control. Proc. Ore. Weed Conf. 11:15-16.
5. Ticknor, R. L. 1962. Weed control in tree seedlings. Res. Prog. Rep. West. Weed Conf. pp. 37-38.
6. Ticknor, R. L. 1963. Weed control in conifers. Res. Prog. Rep. West. Weed Conf. pp. 29-30.
7. Ticknor, R. L. 1964. The influence of mulching practices on bud production and plant size. Quar. Bul. Amer. Rhodo. Soc. 18(1): 16-17.
8. Ticknor, R. L. 1964. *Ceanothus prostratus* and *Ceanothus pumilus*-promising ground covers. Amer. Hort. Mag. 43(1):33-36.
9. Ticknor, R. L. 1964. A miniature deciduous *Azalea*. Quar. Bul. Amer. Rhodo. Soc. 18(3):176.
10. Ticknor, R. L. 1964. The native evergreen *Ceanothus* of the Pacific Northwest. Univ. Wash. Arbor. Bul. 27(4):85-87.
11. Ticknor, R. L. 1965. The effect of herbicides on the rooting of juniper cuttings. The Plant Prop. 11(1):8.
12. Clark, R. R. and R. L. Ticknor. 1965. Ornamental and nursery crops. Ore. Weed Control Handbook, pp. 142-147.
13. Ticknor, R. L. 1965, 1967. Tolerance of nursery plants to herbicides. Ore. Weed Control Handbook, pp. 148-159.
14. Ticknor, R. L. 1967. Chemical weed control in *Rhododendrons*. Quar. Bul. Amer. Rhodo. Soc. 21(4):198-201.
15. Ticknor, R. L. and C. A. Nance. 1968. Chemical control of *Rhododendron* growth and flowering. Quar. Bul. Amer. Rhodo. Soc. 22(2):90-95.
16. Ticknor, R. L. 1968. Growth and flower bud production in field-grown *Rhododendrons* treated with growth regulators. Amer. Nurs. 127(10):7-8. 65. 67.
17. Ticknor, R. L. 1968. Defoliating roses with chemicals. Pacific Coast Nurs. 27(11):21-22.
18. Ticknor, R. L. 1970. Influence of fertilizers and growth regulators on flower bud production of field-grown *Rhododendrons*. Proc. Int. Plant Prop. Soc. 19:305-310.
19. Crabtree, Garvin. 1970. Combinations of herbicides and mulches in *rhododendrons*. Quar. Bull. Amer. Rhododendron Soc. 24(4):240-241.
20. Ticknor, R. L. 1971. Landscape tree performance. Ore. Agric. Exp. Sta. Cir. of Info. 663.

Root Regeneration Research

Cutting Propagation: One of the most productive lines of research undertaken during the past 15 years has been the studies connected with root regeneration in stem cuttings. This work was initiated in 1958 by Larry Blaney and one of the graduate students on the Nursery Council assistantship, Conrad Weiser (now head of the Department of Horticulture at Oregon State). Working with a number of species, they found boron to be a factor in root regeneration. Since

that time, a number of graduate students receiving financial support from the Oregon Nursery Council have worked on the physiology of root regeneration in rhododendrons.



Dense plantings mark the Lewis-Brown Horticultural Farm near Corvallis where the ornamentals field laboratory is located.

Credit should also be given to the Hill Family Foundation for continued support of the Douglas-fir rooting project. The graduate students, technicians, as well as equipment and supplies supplied by this foundation have made it possible to make real gains in our understanding of root regeneration in conifers.

The results of these studies have appeared in the papers listed below and reprints of these are available to the industry:

1. Duruz, W. P. 1954. Propagation and improvement of horticultural plants. Ore. St. Univ. Bul. 529.
2. Weiser, C. J. 1959. Effect of boron on the rooting of clematis cuttings. Nature 183:559-560.
3. Weiser, C. J. and L. T. Blaney. 1960. The effects of boron on the rooting of English holly cuttings. Proc. Amer. Soc. Hort. Sci. 75:704-710.
4. Weiser, C. J. and L. T. Blaney. 1967. The nature of boron stimulation to root initiation and development in beans. Proc. Amer. Soc. Hort. Sci. 90:191-200.
5. Adams, D. G. and A. N. Roberts. 1967. A morphological time scale for predicting rooting potential in *Rhododendron* cuttings. Proc. Amer. Soc. Hort. Sci. 91:753-761.
6. Johnson, C. R. and A. N. Roberts. 1967. Leaf and apical bud removal as a means of studying the influence of flowering on rooting in *Rhododendron*. Proc. Inter. Plant Prop. Soc. 17:180-183.

7. Johnson, C. R. and A. N. Roberts. 1968. The influence of terminal bud removal at successive stages of shoot development on rooting of *Rhododendron* leaves. Proc. Amer. Soc. Hort. Sci. 93:673-678.
8. Adams, D. G. and A. N. Roberts. 1968. Time of flower initiation in *Rhododendron 'Roseum Elegans'* as related to shoot and leaf elongation. HortScience 3(4):278-279.
9. Roberts, A. N. and F. W. Moeller. 1969. Timing in cutting propagation as related to developmental physiology. Comb. Proc. Int. Plant Prop. Soc. 19:77-82.
10. Johnson, C. R. and A. N. Roberts. 1971. The effect of shading rhododendron stock plants on flowering and rooting. J. Amer. Soc. Hort. Sci. 96(2):166-168.
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Root Regeneration and Transplant Problems: Balling and burlapping of conifers may someday become obsolete. During the past three years, work was initiated by Les Fuchigami, Ray McNeilan (past extension agent and graduate student of Oregon State University), and Garth Veerkamp (graduate student on the Nursery Council assistantship) to study the regeneration of roots of field-grown conifers. Preliminary studies suggest the feasibility of bare-rooting conifers. The root regeneration potential is highly dependent on the plants' physiology and environment. From these studies, several nurserymen have successfully bare-rooted conifers.

Plant Conditioning Research

Plant Hardiness: Plant injury resulting from freezing temperatures is always a threat to nurserymen. Prior to returning to Oregon State, Dr. Weiser was the director of the Plant Hardiness Laboratory at University of Minnesota. He is world renown for his research in cold hardiness and has published voluminously in this area.

In addition to Dr. Weiser's expertise in the area of cold hardiness, two new members to the department, Drs. Fuchigami and Richardson, have had excellent training in the area of plant hardiness. As a unit they can provide the department with one of the country's strongest teams in plant cold hardiness.

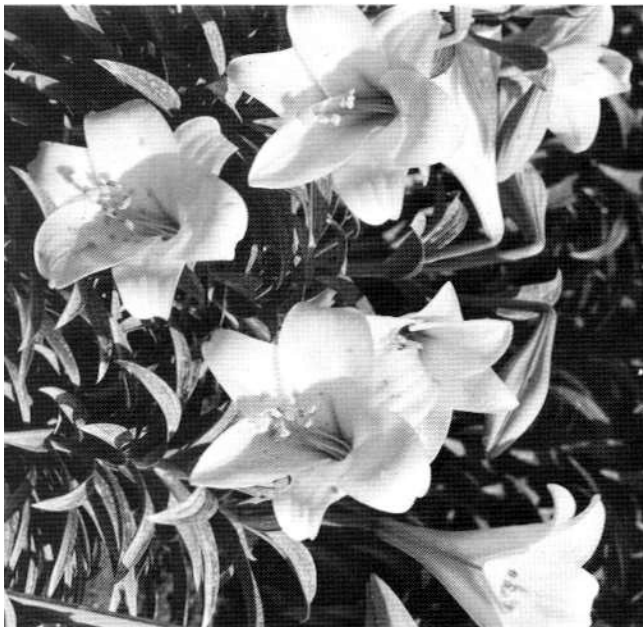
Plant Maturity: To provide continuity with some of the research done in the past, Dr. Fuchigami and his graduate students (Cary Sun and Sister Mary Hotze) have elected to identify and solve the problems of defoliation, maturity, and storage of deciduous nursery stock. Studies within defoliating trees, measuring maturity development, prolonging storage life, and delaying spring bud-break in deciduous trees.

Publications (hardiness):

1. Fuchigami, L. H., D. R. Evert, and C. J. Weiser. 1969. A translocatable hardiness promoter. HortScience.
2. Fuchigami, L. H. and C. J. Weiser. 1970. A technique for the axenic culture and feeding of excised woody stems. Plant Physiology 46:845-846.
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The Future

As we move into the fourth decade of nursery and ornamental crop research in Oregon and the Northwest, we welcome with great anticipation the participation of the new USDA Regional Ornamentals Laboratory into the research family. The establishment of a research laboratory in this region devoted entirely to ornamentals research will go a long way in helping supply the research information needed by a rapidly expanding ornamentals industry in the Northwest. We therefore heartily welcome our colleagues Drs. Bob Linderman, Duane Coyier, and Varon Jensen to our midst. We look forward with confidence to the decades ahead, knowing that



research in ornamentals is being well-supported. Again, it has been the industry people who have made these major gains possible.

Breeding of easter lilies is one of the activities at the Pacific Bulb Growers Research and Development Station at Harbor.

OSU has excellent greenhouse and growth chamber facilities for research (upper left). Ornamentals research is conducted in houses that were constructed in part from funds supplied by the Oregon Association of Nurserymen and the Oregon Federation of Garden Clubs. Houses in lower right are used for resident instruction.



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