# PUBLICATIONS
# 1985

# Horticultural Research, 1985--Overton

Research Center

TECHNICAL REPORT

NO. 85-1

THE TEXAS AGRICULTURAL EXPERIMENT STATION / Neville P. Clarke, Director / The Texas A&M University System / College Station, Texas

AN OVERVIEW OF ROSE RESEARCH AT OVERTON 1985

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East Texas is one of the main centers for rose bush production in the United States (Stump, 1982). Approximately 12.5 and 1.5 million bushes were grown during 1984 in Smith and Van Zandt counties, respectively (Texas Power and Light, 1985). Additionally, large cooling facilities have been established for bush storage and to facilitate the packaging and final marketing operations.

The East Texas rose industry has expressed a desire for technical research to enable them to remain a viable part of the American nursery industry. To this end, the Texas Agricultural Experiment Station has initiated a rose research program at the Agricultural Research and Extension Center at Overton. Brent Pemberton was hired in 1982 as a research leader for this project and Vince Haby, soil scientist, received a 25% appointment in rose research. Since the establishment of the rose research project, many experiments have been initiated to study problems at various steps during the production cycle.

Rose Bush Production Cycle

Removal of all but the apical two or three buds of *Rosa multiflora* 'Brooks 56' rootstock cuttings is the first step in a labor intensive, two-year cycle for rose bush production. The rootstock cuttings are removed from established crop rotations and planted in December. In May, a bud from a desired cultivar is grafted (T-bud) onto the rootstock stem just below the actively growing shoots. The grafted scion bud is usually inactive until March of the following spring when the rootstock shoots are removed. Active growth of the scion bud commences and continues through the growing season. The following December, the dormant plants are dug and stored. Approximately 25 manual labor steps are involved before the plants are marketed.

Propagation

Problems with rooting and grafting techniques used for the vegetative propagation phase cause tremendous production losses. Understanding which characteristics of rootstock plants are important for determining subsequent rooting of cuttings is critical to increasing percent stand in the field. Controlled rooting studies were initiated and demonstrated increased rooting as a result of chemical and wounding treatments. However, no significant differences were found in the field (Davies, 1983). A study of the relationship between planting date and carbohydrate and nitrogen content of rootstock cuttings and cutting survival and growth is being repeated in cooperation with Fred Davies (TAES, College Station). A graduate student (M.S.), Eddie Hambrick, is working on the project. The optimum propagation date was found to be December 15 and basal cuttings rooted better than apical ones during the first year of study (Hambrick et al., 1984).

New grafting techniques are being explored which could give stronger graft unions as well as shortening the production cycle to one year for a field or container produced plant. Chip budding, a technique which allows grafting of dormant rootstock cuttings before planting, is being studied (Davies et al., 1980). Results have indicated that bud survival percentages can be high. Even though scion growth was totally inhibited by the remaining buds on the chip budded cutting, these buds promote root growth needed for strong bush production (Davies and Fann, 1981; Fann et al., 1983a; Fann et al., 1983b). Studies are in progress to explore the timing of chip budding and understock top removal.

Other grafting techniques are also being explored. Cleft grafting of a two-bud scion cutting onto a disbudded rootstock could allow rooting and healing before field or container planting. Researchers hope this technique will increase stand percentage and final plant grade as well as shorten the time of production.

Tissue culture is a new method of propagating roses which is increasing in popularity. This process offers the potential for more economic production of plants on a larger scale than now possible. Tissue cultured plants of several rose cultivars are being grown in different size containers using different media mixes. These plants will be grown in the field with field grown bare root plants to compare consumer performance during the 1986 growing season. Possible cooperation with John Frett (TAES, College Station) studying tissue culture manipulation of rose plantlets in relation to container and/or field production is being pursued.

## Root-Soil Complex

Little research has been documented concerning soil fertility levels needed to supply plant nutrition requirements of field grown rose plants. East Texas soils are acid (as low as pH 4.5) and present a complex of nutrition related problems for rose producers. These include lime requirements for adjustment of soil pH, as well as the requirement of the plants for nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur. The micronutrients zinc, boron, and molybdenum must also be considered. Toxicities of manganese and/or aluminum are potential problems to roses in very acid soils. A cooperative research project has been established to evaluate the influence of limestone, phosphorus, and potassium on rose rootstock growth and the second year of plant production. Grafted bud survival, subsequent rootability of rootstock cuttings from plants fertilized during the first year of production, and final plant grade are being studied and related to soil pH and phosphorus and potassium treatments. Preliminary observations from the first year of field trials indicate that increased bud graft survival resulted from preplant applications of phosphorus at 139 kg/hectare (124 lbs/acre) and calcitic limestone at 3364 kg/hectare (3000 lbs/acre) (unpublished data, V. A. Haby and H. B. Pemberton). In addition, when rootstock cuttings were rooted in the field for 21 weeks, those from stock plants treated with 0 or 1120 kg/ha (0 or 1000 lbs/acre) lime plus 62 or 124 lbs/acre (69 or 139 kg/ha) P produced more roots than cuttings from plants treated similarly with lime but with no P. Cuttings from plants treated with 3360 kg/ha (3000 lbs/acre) lime and 0 or 139 kg/ha (124 lbs/acre) P produced more roots than cuttings from plants treated similarly with lime but with 69 kg/ha (62 lbs/acre) P (lime x P interaction). Cuttings from plants treated with 139 kg/ha (124 lbs/acre) P produced more shoot dry weight than cuttings from plants treated with 0 or 69 kg/ha (62 lbs/acre) P (main effect). Rootstock plants treated with lime and P appeared to produce cuttings with a better propensity for growth than cuttings from untreated plants (Pemberton et al., 1985). Additional research is planned to improve identification of specific deficiency symptoms on plants and to further evaluate fertilizer nutrient needs of field grown rose plants. In addition, an experiment studying how levels of various nutrients relate to growth, soil and tissue analysis levels, and mycorrhizal development has been initiated.

The importance of soil microorganisms to rose bush growth has been recently demonstrated by Paterson (Taes, Overton). Stunting of rootstock plants resulted from fumigation treatments. Ruth Taber (TAES, College Station) has confirmed the presence and absence of mycorrhizal fungi in the nonfumigated and fumigated plots, respectively (Paterson et al., 1983a; Paterson et al., 1983b; Paterson et al., 1984). Mycorrhizal associations have been studied in other crop plants, but not for roses (Paterson et al., 1983c). In addition, when Rosa multiflora 'Brooks 56' cuttings were grown in 0.01 normal nutrient solution and inoculated with vesicular arbuscular mycorrhizae (VAM) from live rose roots, the VAM caused a significant increase in both fresh and dry weight of R. multiflora shoots. Infection from at least two genera of mycorrhizal fungi was observed (Taber et al., 1983). An experiment was begun in December, 1984 to study the time course of mycorrhizal infection of newly planted rootstock cuttings in three grower fields. This information will be important to interpretation of future studies of fertilization and chemical pest control practices and development of industry recommendations.

Nematodes continue to constitute a major problem for rose producers. An infested plot is being established at the Overton Center for a cooperative project with James Starr (TAES, College Station) to determine control measures for this group of pests which can render an entire crop unsaleable. A field sampling survey has been completed along with a survey of rose growers to determine the severity of the nematode problem in the local industry. Results indicate that at least 10% of the rose growers responding have a major problem with root-knot nematode (Forse et al., 1984). Much of the damage attributed to root-knot nematodes could be caused by dagger nematodes due to large local populations. Crown gall is also a serious problem.

In addition to the survey, granular nematicide demonstration treatments have been applied in cooperation with Joe Radford of the IFPP program and Jim Starr, in a grower's field where nematodes have been found. Final data are being collected. Also, a fumigation study has been completed in cooperation with principal investigator Don Paterson, which emphasized effects of methyl bromide, a possible nematode control agent, on rose plant production. As stated above, plants in the fumigated plots were stunted during the first year of growth, but differences were not as apparent after two years. Herbicide treatment improved plant growth in non-fumigated plots.

Branching

Basal branching is a critical factor in rose bush production, as the final grade of a plant and thus the dollar value is largely based upon this character. Pruning practices are suspected to have an influence on cane production and are being studied. Timing of pruning treatments will likely be critical. In addition, growth regulator applications will be studied to determine if increased basal branching can be induced.

Cultural Practices

Currently, most rose crops are not irrigated in East Texas. Though the area receives an average of 100 to 110 cm (40-44 inches) of rainfall each year, very little occurs in July, August, or September. Two studies have been initiated to determine whether wider spacings in a dry land situation would be beneficial for production of higher grade plants. Carbohydrate samples are being collected from the irrigated vs. non-irrigated plots to determine the effects of water stress on carbohydrate distribution, an important factor for vigor and final cane caliper grade of the plant.

Weed control is critical for successful rose bush production in East Texas. Herbicide use is rapidly replacing the hoe for keeping rose fields free of weed competition which can dramatically lower plant grade and crop value. Paterson et al., (1980) have found tht oryzalin (Surflan), napropamide (Devrinol), and simazine (Princep) plus Surflan would control a broad spectrum of grass and broadleaf weed species. However, Surflan, at 4.5 kg active ingredient (ai)/hectare (4 lbs ai/acre), can cause leaf chlorosis on rootstock plants and plants in their second year of production. New pre- and post-emergent herbicides will continue to be tested in grower fields to determine levels of control and phytotoxicity. Recently, a mixture of metolachlor (Dual) and Princep, applied to budded rootstock plants at 6.7 kg ai/ha (6 lbs ai/acre) and 1.8 kg ai/ha (1.6 lbs ai/acre), respectively, was found to control several weed species including Cyperus esculentus (yellow nutsedge) and Diodia teres (poorjoe) during the first year of plant production (Pemberton et al., 1984). Oxyfluorfen (Goal) controlled the same weed species at 4.5 kg ai/ha (4 lbs ai/acre), but the liquid formulation used burned and defoliated the roostock plants. A new chemical developed for grass control in broadleaf crops will be tested for phytotoxic effects on rose plants this spring.

Disease control is necessary for economic rose plant production. Spray trials for powdery mildew and blackspot have been initiated with George Philley (TAEX, Overton). No improvement over current practices have been found. However, a planting devoted to spray trials for prevention of blackspot and powdery mildew has been established at Overton to continue this work successfully.

Virus diseases have been on the increase in rose plant production in this country. To determine the extent of the problem in Texas, a study comparing plants grown from California indexed virus free budwood and rootstock to those grown from locally produced material has been initiated. Stunted growth and weak graft unions susceptible to wind damage are suspected symptoms of virus infected plants which may not have any visible symptoms.

Forty-three cultivars of roses, some of which have been in cultivation for 400 years and are not common in modern trade, have been planted to initiate a search for disease resistant rose plant material suitable for re-introduction to the landscape nursery market. Cultivars will be continually added, observed, and tested for commercial and scientific value. These cultivars will enable a long term basic study of disease resistance physiology, resistance being a very desirable commercial trait.

Post Harvest Practices

The use of anti-transpirant or fruit wax dips is being explored in an effort to replace the practice of waxing rose bush canes. Currently, processors dip the canes of packaged plants in hot wax to prevent cane dessication during the marketing period. Waxing is undesirable to the consumer and has caused more rapid sprouting when compared to nonwaxed canes in a preliminary study (unpublished data, H. B. Pemberton). The use of cane dips appears promising, but further studies are needed. Future experiments will include determination of the gas content of the atmosphere produced in rose canes by waxing.

In addition to work with standard rose bushes, work on shipment of miniature roses has begun in cooperation with John Kelly (TAES, College Station) studying the effects of high temperatures during dark storage on leaf abscission. This work will enable the long distance shipping of miniature roses for mass marketing. Currently, this practice is risky due to deterioration of the plants during the shipping period.

Basic Research

The research program discussed to this point is largely applied in nature. A physiology lab is currently being equipped to enable identification and quantification of specific plant hormones and carbohydrates. The process of developing extraction procedures for abscisic acid (ABA), a plant hormone, from tissue has begun. Further development of this analytical capacity is currently in progress and will enable the study of hormonal and photosynthate production and partitioning relationships and how these factors are involved in the developmental processes of rooting, graft healing, and branching in roses. This basic program of research will allow the applied program to be supported and sustained.

## LITERATURE CITED

Davies, F. T., Jr. 1983. Adventitious root formation in Rosa multiflora 'Brooks 56' hardwood cuttings. HortScience 18:173 (Abstr.).

Davies, F. T., Jr. and Y. Fann. 1981. Alternative propagation techniques for producing Texas field rose bushes. Proc. Intnl. Plant Prop. Soc. 31:643-648.

Davies, F. T., Jr., Y. Fann, and J. E. Lazarte. 1980. Bench chip budding of field roses. HortScience 15:817-818.

Fann, Y., F. T. Davies, Jr., and D. R. Paterson. 1983a. Correlative effects of bench chip budded 'Mirandy' roses. J. Amer. Soc. Hort. Sci. 108:180-183.

Fann, Y., F. T. Davies, Jr., and D. R. Paterson. 1983b. The influence of rootstock lateral buds on bench chip budded 'Mirandy' field roses. Scientia Horticulturae 20:101-106.

Forse, L. B., J. L. Starr, H. B. Pemberton, and D. R. Paterson. 1984. Losses due to nematodes and crown gall in the East Texas rose bush industry. TX Ag. Expt. Stat. Prog. Rept. PR-4255.

Hambrick, C. E., III, F. T. Davies, Jr., and H. B. Pemberton. 1984. Correlation between carbohydrate/nitrogen ratio and rooting ability in Rosa multiflora stem cuttings. HortScience 19:566 (Abstr.).

Paterson, D. R., R. M. Menges, D. R. Earhart, and M. C. Fuqua. 1980. Herbicide Research with East Texas Roses, 1977-79. Texas A&M Ag. Exp. Station PR-3752.

Paterson, D. R., R. A. Taber, D. R. Earhart, and H. B. Pemberton. 1983a. Influence of methyl bromide soil fumigation on VA mycorrhizal infection of Rosa multiflora understock. HortScience 18:173 (Abstr.).

Paterson, D. R., R. A. Taber, D. R. Earhart, H. B. Pemberton, G. A. Rowland, and W. E. Roberson. 1983b. Influence of methyl bromide soil fumigation on VA mycorrhizal infection and growth of Rosa multiflora understock. HortScience 18:607 (Abstr.).

Paterson, D. R., R. A. Taber, D. R. Earhart, H. B. Pemberton, G. A. Rowland, and W. E. Roberson. 1983c. Mycorrhizae beneficial soil fungi. TX Ag. Expt. Stat. Tech. Rpt. 83-3:54-66.

Paterson, D. R., Ruth A. Taber, D. R. Earhart, H. B. Pemberton, G. A. Rowland, and W. E. Roberson. 1984. Influence of soil fumigation, herbicide, variety, and fertilizer on grade of _Rosa multiflora_/Mirandy and _R. multiflora_/Tiffany cultivar combination. HortScience 19:521 (Abstr.).

Pemberton, H. B., V. A. Haby, W. E. Roberson, and J. V. Davis. 1985. Increases in root and shoot growth of _Rosa multiflora_ cuttings taken from stock plants fertilized with lime and P. HortScience (Abstr.). (In press).

Pemberton, H. B., R. M. Menges, and W. E. Roberson. 1984. New chemicals for weed control in field production of rose plants during the first season of growth. Proc. of TX State Hort. Soc. (In press).

Stump, D. S. 1982. Research Summary - The census of horticultural specialties. Hort. Research Institute, Washington, D.C.

Taber, R. A., D. R. Paterson, H. B. Pemberton, D. R. Earhart, G. A. Rowland, and W. E. Roberson. 1983. Influence of indigenous rose root mycorrhizal and nutrient solution concentration on growth of _Rosa multiflora_ understock. HortScience 18:571 (Abstr.).

Texas Power and Light. 1985. Agricultural Income 1984. Texas Power and Light. Dallas, Texas.