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COMPACT NEWS
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IDFTA AWARDS

At the 38th Annual Conference in Hershey, Pennsylvania, IDFTA honored the following four individuals for outstanding contributions to the education mission of IDFTA and to the art and science of fruit growing.

Dr. Hermann Oberhofer of South Tyrol, Italy, is recipient of a special IDFTA award for his worldwide service as an educator and as an innovator of production systems and of plant protection programs. Dr. Oberhofer recently stepped down as head of the Südtiroler Beratungsring für Obst- und Weinbau (South Tyrolean Advisory Service for Fruit and Grape Growing). He is currently head of Arbeitsgruppe für Integrierten Obstbau in Südtirol (AGRIOS; Working Group for Integrated Fruit Production in South Tyrol). This organization administers integrated fruit production, the use of agricultural chemicals in fruit production with minimal environmental impact. Dr. Oberhofer is author of Schnitt der Schlanken Spindel (Pruning the Slender Spindle), an outstanding guide to slender spindle orchard management that has been translated into English and is widely distributed throughout the world. He has always been willing to share his ideas and information about high density fruit production with fruit growers from around the world. He was a featured speaker at the IDFTA annual conference in 1987 in Toronto, Canada. He has always been a gracious and very informative host for numerous tour groups and individuals who have visited South Tyrol. These accomplishments have made him one of the most widely known and appreciated pomologists worldwide.

Dr. Tara Auxt Baugher, who recently stepped down as Horticultural Extension Specialist and Professor of Horticulture, West Virginia State University, is the recipient of the IDFTA researcher of the year award. She was located at the West Virginia University Experiment Station in Kearneysville. Dr. Baugher spoke at IDFTA conferences on three occasions, first as a graduate student, and has coordinated two IDFTA summer tours. She is currently a member and secretary of the IDFTA rootstock research committee. At the Kearneysville Experiment Station she used the extensive orchard systems trials to develop a "total system" approach to intensively managing fruit trees and was actively involved in testing of new varieties for the mid-Atlantic region. Through in-depth regional educational programs, she helped mid-Atlantic growers make the transition to dwarfing rootstocks and intensive orchard systems.

Jerome L. (Jerry) Frecon, tree fruit extension agent with Rutgers University, New Jersey, is the recipient of the IDFTA outstanding service (extension) award. Jerry received his B.A. degree from Delaware Valley College and M.S. from Rutgers University. He has taught at Delaware Valley College and worked in research, development and sales in the tree fruit nursery industry. His extension program in New Jersey is recognized as one of the outstanding programs nationally and he recently received the National Agricultural Agents' Association "Distinguished Service Award." His area of specialization is peach cultivar evaluation and peach management. He is frequently asked to speak at industry meetings and has made five presentations at IDFTA conferences. He is an excellent communicator at meetings and with his many publications. He is readily accessible to growers in his area and the interest of those he serves comes first.

Bennett Sanders, orchardist in Piney River, Virginia, received the IDFTA grower award for 1995. Bennett, along with his three brothers, Tom, Jim, and Robert, and father, Paul, own Sanders Brothers Orchards. The orchard of 100 acres of apples, 25 acres of peaches, as well as an ornamental nursery, was started by Bennett's grandfather and his four brothers. Bennett has been an industry innovator and has always been willing to try new varieties. In 1989 before most orchardists in the mid-Atlantic region thought about Gala, Fuji, and Braeburn, Bennett planted an orchard of these new varieties. His new plantings of modified and scaled down central leader trees are planted at moderate to high densities of 400 to 700 trees per acre. His innovation and enthusiasm are an inspiration to orchardists in the mid-Atlantic region. ❑

IDFTA CALENDAR

June 24-July 9, 1995 – European Tree Fruit Study Tour. Space still available. Call Curtis-C Travel: 800-562-2580.

Feb. 25-29, 1996 – 39th Annual Conference, Penticton, British Columbia, Canada

June 23-25, 1996 – Summer Tour, Michigan

Feb. 23-26, 1997 – 40th Annual Conference, Rochester, NY

October 1997 – Japan Tree Fruit Study Tour including World Fuji Summit, Nagano, Japan

IDFTA RESEARCH FUNDING

During the 38th annual IDFTA conference in Hershey, Pennsylvania, the Rootstock Research Committee met to review 26 research proposals submitted by researchers in the U.S. and Canada. At the recommendation of the Rootstock Research Committee, the IDFTA Board of Directors approved funding for 1995 for the following 15 research projects:

Project Leader	Location	Project Title	Funding Allocation
John A. Cline	ONT	Basis of yield and fruit quality of Empire and Jonagold in 3 orchard systems	$ 2,000
J. N. Cummins, D. R. Gill, H. Aldwinckle, J. Norelli and H. Gustafson	NY	Fire blight resistance evaluation of 25 apple rootstocks	$ 1,000
Gregory A. Lang	WA	Sweet cherry canopy architecture, Giessen rootstocks, and intensive cropping management	$ 4,350
Wendy McFadden-Smith	ONT	Evaluation of Prunus rootstocks for resistance/tolerance to the lesion nematode, Pratylenchus penetrans	$ 1,500
Stephen C. Myers	GA	Vegetative propagation of peach rootstock, BY520-9	$ 1,500
Larry Pusey	WA	Evaluation of apple rootstock for susceptibility to fire blight	$ 1,200
H. A. Quamme	BC	Evaluation of cold hardiness of apple rootstocks	$ 3,500
Gregory L. Reighard	SC	Evaluation of interstems in stone fruit orchard systems	$ 2,000
Terence Robinson and Stephen Hoying	NY	Commercial orchard evaluation of the new Cornell-Geneva rootstocks	$ 3,000
Curt R. Rom	AR	Phenolic content of apple rootstocks and Malus species in relation to insect feeding and stress resistance	$ 2,000
Ed Stover	NY	Screening Malus rootstocks for resistance to replant disease	$ 1,000
Bradley H. Taylor	IL	Evaluation of new apple interstem/rootstocks under stress	$ 2,000
Gus Tehrani	ONT	Performance of Anjou, Bartlett and Bosc pear cultivars on standard and Old Home X Farmingdale clonal rootstock	$ 1,000
Michele Warmund	MO	Performance of Fuji on clones of Malling 9 and other dwarfing rootstocks	$ 1,000
Michele Warmund and Paul Domoto	MO	Enhancing growth and yield of trees on Mark rootstock by inarching a different dwarfing rootstock to the scion	$ 1,000
		TOTAL	**$28,050**

APPLE ROOTSTOCK DESCRIPTIONS–PART III ELEVEN ROOTSTOCKS IN THE M.26 TO M.7 VIGOR RANGE

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This is the third part of an article describing apple rootstocks. Parts I and II appeared in Compact News (November 1994 and January 1995). Part I included the following rootstocks less vigorous than M.9 EMLA (E): M.27E, P.16, P.22, V.3, B.146, B.491, G.65 and Mark. Part II included the following rootstocks in the M.9E vigor range: P.2, CG.10, M.9E, V.1, CG.16, J9, B.9, O.3, Bemali and MAC.39. Rootstock descriptions are presented here for 11 rootstocks in the M.26 to M.7 vigor range. They are listed in order of increasing tree vigor, although differences in closely ranked rootstocks may be small. In addition, all 29 rootstocks are compared in Table 1 for disease and insect resistance, productivity, fruit size, root suckers and burrknots.

C6: C6 is a dwarfing rootstock originally introduced by Stark Bro's Nurseries and Orchards Co. as a dwarfing interstock. C6 is an open-pollinated seedling of M.8. It produces a tree similar to M.26E in size. Precocity has been similar to M.9E but yield efficiency of C6 has been less than for M.26E. Fruit size has been similar to M.9E and M.26E. It is susceptible to fire blight. Some root suckering occurs with C6. It does not appear to be a potential replacement for M.26.

G.11: Geneva 11 is a dwarfing rootstock released in 1993 from the Cornell University breeding program at Geneva, New York. It originated from a cross of M.26 X Robusta 5. G.11 tree size is similar to or slightly larger than M.26. Scion varieties are precocious and productive on G.11. It is moderately resistant to fire blight, resistant to collar rot and moderately susceptible to woolly apple aphid. It propagates easily in the stoolbed, has few burrknots, and suckers are rare. G.11 is a new rootstock planted in 1992, 1993 and 1994 NC-140 trials throughout North America.

M.26: Malling 26 is a dwarfing rootstock introduced from the East Malling Research Station, England, in 1959, the result of a cross of M.9 X M.16. M.26E produces a tree approximately 50 percent larger than M.9E (tree size for M.9E = 100, for M.26E = 150) and approximately 25 percent smaller than M.7A. M.26E, a heat-treated virus-free clone, produces trees comparable in size to the original M.26 clone. M.26E is intermediate in precocity and yield efficiency, being less precocious and less yield efficient than M.9E and more precocious and more yield efficient than M.7A. Fruit size with M.26E has been large and similar to M.9E. In some situations trees on M.26 can be freestanding. However, it is prudent to support M.26 trees to prevent leaning or breakage and to aid in central leader training, particularly if early cropping is a requirement.

M.26 produces few suckers. Burrknots are prevalent on the rootstock shank between the bud union and the soil line. For this reason the bud union should be placed near the soil line but not so close to the soil line that scion rooting occurs. M.26 is rather shallow-rooted and careful attention must be paid to irrigation management to avoid drought.

M.26 is moderately susceptible to collar rot but, on light soils with care to avoid over-irrigation, collar rot problems can be minimized. Preventive fungicide applications may be useful. M.26 is very susceptible to fire blight and to woolly apple aphid. It is a winter-hardy rootstock with greater hardiness than M.9 and M.7 and comparable hardiness to O.3, B.9, P.2 and P.22. M.26 propagates well in the stoolbed, much better than M.9.

In many fruit districts in the United States and Canada M.26E is a commercially important dwarfing rootstock. It is not widely used in Europe because M.9 is more dwarfing and therefore more suitable for high density plantings. In some North American fruit districts, M.26E may lose favor to M.9E or newer rootstocks in the M.9E vigor range as the trend toward higher density orchards intensifies.

V.2 and V.7: Vineland 2 and Vineland 7 are new dwarfing rootstocks from the Vineland, Ontario, breeding program. They are open pollinated seedlings of the crabapple variety Kerr (Dolgo X Haralson). The pollen parent is believed to be M.9. V.2 and V.7 have been evaluated for a relatively short time and at few sites (Ohio and Washington) and therefore estimates of tree size and productivity are preliminary. V.2 and V.7 have produced trees generally intermediate in size and yield efficiency between M.26E and M.7A. Fruit size has been similar to M.9E. V.2 has some root suckers while V.7 has very few. Their winter hardiness, disease and insect resistance, incidence of burrknots and need for support have not been determined.

CG.24: Cornell-Geneva 24 is a semi-dwarfing rootstock from the Cornell University breeding program at Geneva, New York. CG.24 is an open pollinated seedling of the very dwarfing M.8 rootstock. It produces a tree similar in size to M.7. CG.24 is less productive than M.7 and M.26. It is susceptible to fire blight. CG.24 is from an early series of Cornell rootstocks and is no longer regarded as promising.

M.7: Malling 7 is a semi-dwarfing rootstock of the original series of Malling rootstocks (also known as Type VII, EM.VII, EM.7, M.7A, M.7 EMLA and Doucin). M.7 trees are approximately 30 percent larger than M.26E trees (tree size for M.26E = 100, for M.7 = 130). They are slightly smaller than trees on MM.106 and 50 to 65 percent the size of seedling trees. M.7 is generally too vigorous for high density plantings except for weak cultivars such as Braeburn and spur Delicious and very weak soils. M.7 has been the most widely planted clonal rootstock in the U.S. during the past 30 years. Its precocity and yield efficiency are considerably less than more dwarfing rootstocks such as M.9E and M.26E. Fruit size is generally smaller than with M.9E and M.26E. It is very easily propagated in stoolbeds. It has burrknots and more root suckers than other commonly used rootstocks. It is susceptible to woolly apple aphid. It has a moderate level of field tolerance to collar rot, although it is susceptible. It is resistant to fire blight. Although M.7 is not considered to be winter hardy, and in this regard is similar to M.9, it has proved to be sufficiently hardy in most North American fruit districts. On windy sites M.7 trees often lean with heavy crops. On such sites it may be advisable in the early years to support the lower trunk to a height of about 3 feet.

CG.30: Cornell-Geneva 30 is a semi-dwarfing rootstock from the Cornell University breeding program at Geneva, New York. It originated from a cross of Robusta 5 X M.9. CG.30 tree size is similar to M.7. Scion varieties are more productive and precocious with CG.30 than with M.7. It is resistant to fire blight, tolerant to collar rot and moderately susceptible to woolly apple aphid. It has very few burrknots and fewer root suckers than M.7. CG.30 is a new rootstock planted in 1992, 1993 and 1994 in NC-140 trials throughout North America.

OAR.1: Oregon Apple Rootstock 1 is a semi-dwarfing rootstock discovered as a chance seedling in Oregon. It produces a tree similar to M.7 in size. OAR.1 is not precocious. Its yield efficiency has been extremely low, lower than M.7. This is partially due to its very small fruit size. It is difficult to propagate in stoolbeds. OAR.1 produces few root suckers or burrknots. It appears to be moderately resistant to fire blight and is susceptible to woolly apple aphid. OAR.1 is not a promising rootstock.

P.1: P.1 is a semi-dwarfing rootstock from the Polish breeding program that originated from a cross of M.4 X Antonovka. In recent North American trials P.1 has produced trees similar to M.7 and MM.106 in size. However, in European studies P.1 has produced trees in the M.9 to M.26 size range. Yield efficiency of P.1 is low and generally similar to M.7 in North America. Fruit size is smaller than for M.9E and M.26E. P.1 propagates very easily. It produces root suckers about as frequently as M.7. A ring of many small burrknots usually develops just below the union and can become a serious problem. It is similar in winter hardiness to M.9, M.7 and P.16 and is less hardy than P.2, P.22, B.9, O.3 and M.26. P.1 is resistant to collar rot but susceptible to fire blight and woolly apple aphid. It is not promising in comparison with M.7.

V.4: Vineland 4 is a new semi-dwarfing rootstock from the Vineland, Ontario, breeding program. It is an open pollinated seedling of the crabapple variety Kerr (Dolgo X Haralson). The pollen parent is believed to be M.9. It produces a tree somewhat larger than M.7. V.4 is about as precocious and yield efficient as M.7 and therefore is less precocious and yield efficient than M.9E and M.26E. Fruit size with V.4 is similar to M.7. V.4 produces more root suckers than M.7. As a new rootstock, its winter hardiness and disease and insect resistance are not known.

Acknowledgment. The International Dwarf Fruit Tree Association and the Washington Tree Fruit Research Commission provided financial support for rootstock evaluations. The assistance of Marc Dilley and Bonnie Konishi is gratefully acknowledged as is the sharing of results by NC-140 colleagues. ❑

IDFTA NEW OFFICERS AND BOARD MEMBERS

The IDFTA President and Vice President each serve for two year terms and Board of Director members may serve for nine years. Jack Pheasant, East Wenatchee, WA, completed his second year as president and has served as a board member for nine years. Jack has provided outstanding leadership and dedication to IDFTA. Darrel Oakes, Lyndonville, NY, served as vice president for two years and in 1995 assumes the office of president for two years. Dennis Courtier, Lake City, MN, was elected vice president. Gary Mount, Princeton, NJ, was re-elected to the board of directors. Four new members elected to the board of directors were Joseph Burnham, Berlin Heights, OH; Jim Lott, Gardners, PA; Kent Waliser, Milton-Freewater, OR; and Steve Klackle, Greenville, MI. Retiring from the board of directors after long and distinguished service to IDFTA were Mitch Lynd, Pataskala, OH; Arthur Lister, Ludington, MI; Joseph Wentzler, Muncy, PA; and Jim Eckert, Belleville, IL.

Table 1

Subjective ratings for rootstock characteristics for 29 dwarf and semi-dwarf apple rootstocks. Ratings vary from 1 to 5, 1 being least desirable and 5 most desirable. A rating of 1 indicates extreme susceptibility to fire blight, collar rot and woolly apple aphid, very slow to come into bearing (lack of precocity), low yield efficiency, small fruit size, numerous root suckers and burrknots. A rating of 5 indicates resistance to fire blight, collar rot or woolly apple aphid, outstanding precocity, high yield efficiency, large fruit size and the absence of root suckers and burrknots. A question mark (?) indicates that information is not available or data are conflicting. Rootstocks are listed in order of increasing tree size.

Rootstock	Fire blight	Collar rot	Woolly apple aphid	Precocity	Yield efficiency	Fruit size	Root suckers	Burrknots
Rootstocks less vigorous than M.9E								
M.27E	2	4	2	4	4	3	5	5
P.16	2	2	2	5	5	5	4	4
P.22	2	5	2	5	5	5	5	5
V.3	?	?	?	5	5	5	4	?
B.146	2	?	1	5	5	4	3	2
B.491	2	?	1	4	5	?	4	1
G.65	5	5	3	5	5	?	3	4
Mark	2	4	2	5	5	2	2	2
Rootstocks in the M.9E vigor range								
P.2	2	5	2	5	5	5	5	4
CG.10	2	?	2	3	3	4	4	2
M.9E	1	5	2	5	5	5	4	3
V.1	?	?	?	5	5	5	4	?
CG.16	5	5	2	5	5	?	5	5
J9	1	4	2	5	5	?	4	1
B.9	2	5	2	5	5	5	5	4
O.3	2	5	1	5	5	5	5	5
Bemali	3	?	4	4	4	?	4	3
MAC.39	?	?	?	3	3	5	5	4
Rootstocks in the M.26 to M.7 vigor range								
C6	2	?	?	5	2	5	4	3
G.11	4	5	3	5	5	?	5	4
M.26E	1	2	1	3	3	5	5	2
V.2	?	?	?	3	3	5	4	?
V.7	?	?	?	3	3	5	5	?
CG.24	2	?	2	3	2	?	4	3
M.7	4	3	2	3	2	4	2	2
CG.30	5	5	2	3	4	?	4	4
OAR.1	3	?	1	1	1	1	4	4
P.1	2	4	2	3	3	2	3	1
V.4	?	?	?	2	2	4	2	?

GROWING GALA APPLES IN MASSACHUSETTS

Duane W. Greene and Wesley R. Autio
Department of Plant & Soil Sciences, University of Massachusetts
from Fruit Notes 60(1):12-13; Winter 1995

Gala has been one of the most heavily planted apple cultivars in the past few years. Now that some trees are in full production, it is apparent that growth and management, harvesting, and storage of Gala are different from other cultivars that we are familiar with growing. This paper summarizes some of the modifications and changes that will allow us to grow large, premium quality Gala apples.

Strains–Gala originated in New Zealand and the standard strain is known as Kidd's D-8. The standard Gala is a very attractive apple because it develops a beautiful orange-red color when ripe. There are several other strains of Gala that have been selected primarily for increased red color. All red coloring strains develop more red color, and they generally are more attractive than Kidd's D-8. All striped strains of Gala appear to be somewhat comparable, except for the slightly redder blush color and earlier ripening of Regal (Fulford) Gala. Flavor and quality of red coloring strains appear to be comparable to those of Kidd's D-8. You would not go wrong with selecting any of the red coloring strains.

Growth Habit–Gala is a vigorous tree and it should be grown vigorously. Trees should be staked since they sometimes have a structural weakness at the graft union, particularly when propagated on M.26 rootstock. Trees have willowy branches that are brittle and bend very easily. We do not recommend spreading branches of Gala trees at any age. If limb spreaders are put in, limbs are frequently broken.

Pruning–Proper pruning is more important on Gala than on any other cultivar that we grow. On most cultivars, aggressive pruning reduces flowering and fruit set of apples. This response is less prominent with Gala. It flowers heavily even on upright wood. Many of these flowers set, so cropping is not reduced by pruning. Gala has brittle wood. If left unpruned or lightly pruned, the branches act like an umbrella and layer themselves one on top of another. Fruit do not size, color, or mature properly when this happens. Spurs become weakened because of a lack of sun and this predisposes them to produce small fruit in the future.

Shortening and stiffening branches is an important procedure to prevent drooping and to reduce breakage. More severe pruning than with other cultivars appears to be appropriate. This practice does several things. It removes some of the flowers from the tree. It stiffens branches and allows much better light penetration. It stimulates vegetative growth, and vigorous shoot growth is required for good fruit size. It also renews fruiting wood. All hanging branches should be removed. Summer pruning, done at the traditional time in August, does not appear to be a useful activity on Gala. Color, size, and packout are not improved substantially when pruning is delayed until late in the growing season.

Flowering–Gala is a very precocious tree, thus it blooms and sets fruit very early in the life of the tree. It produces flowers on one-year-old wood and on spurs. The type of bloom that we want for most apples is spur bloom since that produces the largest fruit. Lateral bloom in most circumstances is undesirable because it produces small, inferior quality apples that often have poor finish. Because of their location at the ends of branches, they pull branches down too much. Pruning and thinning strategies should include removing as many lateral flowers and fruit as possible.

Chemical Thinning–A key to good fruit size, high fruit quality and adequate return bloom is good fruit thinning. We have worked and continue to work on chemical thinning strategies. Carbaryl is useful but frequently it is not potent enough for Gala. Some combination of carbaryl with NAA seems to be most appropriate. Aggressive thinning is required in some years, whereas in others it is not. Since we have been unable to predict the situation where aggressive thinning is appropriate, a more moderate approach to chemical thinning is in order to prevent complete defruiting of trees. Specifically, 3 ppm NAA plus 1 lb Sevin 50WP is a good level to try, being aware that some hand thinning may be required. Accel™ does not appear to be very effective for either removing fruit or increasing fruit size with Gala.

Hand Thinning–As stated above, Gala may require some hand thinning. Hand thinning is an opportunity to remove fruit on one-year-old wood and to space fruit on spurs for maximum light interception. It is our experience that hand thinning pays for itself in higher fruit quality, larger fruit size, and better packout.

Fruit Size Strategies–Gala naturally is a medium to small sized apple. Special efforts are required to produce large Gala apples. Any cultural activity that increases spur leaf area will increase fruit size. Work in New Zealand suggests that increasing the number of fruit borne on short shoots is important. Work in Massachusetts suggests that fruit size on two- and three-year-old spurs is comparable to fruit size on short shoots as long as leaf area is comparable. Good chemical and hand thinning is critical. Maintaining proper vigor of the tree is important. Attention to thinning, ground cover management, all aspects of pruning, fertilization, and pest management as it influences leaf quality is required.

Harvest–Gala has the reputation for requiring several harvests. To a certain extent this is true. Proper pruning to position fruit in the appropriate light and good chemical thinning followed by hand thinning will reduce the number of harvests. Using these techniques, we have been able to reduce the number of harvests required for Gala to just two.

Careful attention to the proper time of harvest is important. Gala can mature rapidly through the proper time of harvest. Blocks should be monitored frequently as harvest approaches. Red color is a very poor indicator of maturity. Starch charts have a limited use. Careful monitoring of ground color is undoubtedly the best method. We developed a ground color chart several years ago using Pantone color charts. It appears to be a very reliable predictor of the proper time of harvest. On this chart halfway between green and yellow, nearly white, appears to be the proper stage of maturity to harvest Gala.

Storage–Gala is not a long storing apple. There is a noticeable loss of condition in storage after two months. It also loses much of the aromatic character after extended storage. Gala can be kept in CA storage but the atmospheres used can kill the enzyme responsible for giving Gala the characteristic aromatic flavor and fruitiness. It is not the same apple out of CA storage.

One of the parents of Gala is Golden Delicious. Like Golden Delicious, Gala shrivels in storage. We have seen unacceptable shriveling in regular storage after one month. The length of time before shriveling starts to occur depends upon the year and presumably wax components in and on the skin. Gala should be stored in plastic bags, similar to those used for Golden Delicious.

Hardiness–The 1994 winter was a test winter. In general Gala proved to be hardier than anticipated. We would characterize it as neither tender nor very hardy. However, Gala is incredibly sensitive to cold temperature in the spring. If leaves are damaged by frost, fruit set will be reduced. Gala is the most sensitive cultivar I have seen to cold temperature, once buds start to swell and leaf tissue expands. Plant Gala on sites that are not prone to spring frosts. ❑

PRUNING GALA APPLE TREES TO INCREASE FRUIT SIZE AND QUALITY

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from Fruit Notes 60(1):14-15; Winter 1995

Gala apples have been grown successfully in Massachusetts since 1978. New England appears to have a favorable climate to produce attractive, high quality Gala; however, they can be grown profitably only when fruit size is large. Gala is an apple that normally has medium to small fruit, so special tree management is necessary to produce large fruit that are well colored.

Pomologists for many years have recognized that dormant pruning is a way to increase fruit size of apples. However, if trees are pruned heavily during the dormant season, vegetative growth usually is stimulated, which reduces fruit set, lowers fruit quality, and reduces return bloom. Part of the problem is the shade caused by the new shoots, but summer pruning in July or August will help reduce this effect.

In addition to producing small fruit, Gala trees are difficult to thin, they bloom and frequently set a heavy crop on upright branches and on one-year-old wood, and they have wood that is very flexible and willowy. We noted during the past few years, as we were developing a strategy to grow large Gala, that heavily pruned trees bore the largest and highest quality fruit. Fruit on trees that were lightly or moderately pruned were smaller and had poorer color. On these less-pruned trees, a larger number of fruit were borne on one-year-old wood and weak spurs and, therefore, were naturally smaller than ideal. Additionally, limbs drooped and shaded each other, reducing fruit coloring.

An experiment was initiated to determine if heavy, yet appropriate, dormant and summer pruning could be used as tools to increase the fruit size and color of Gala apples.

Thirty-two trees in a planting of eight-year-old Royal Gala/M.26 were selected and grouped into eight blocks (replications) of four trees each at the Horticultural Research Center in Belchertown, MA. In March, two trees in each block received moderately heavy pruning while the remaining two were lightly pruned. On heavily pruned trees, branches were thinned out and limbs were stiffened by cutting into two- or three-year-old wood. All hanging branches and some one-year-old wood were removed. Light pruning consisted of completely removing crowded branches and thinning the tops of trees. One heavily and one lightly pruned tree in each block were summer pruned in August. Summer pruning consisted of removing upright shoots to improve light penetration and eliminating some hanging branches. The severity of summer pruning was considered moderate. Trees were thinned chemically at petal fall with carbaryl at 1 lb/100 gal. and again at the 10-mm stage of fruit development with a combination of 5 ppm NAA and 1 lb/100 gal carbaryl. No hand thinning was done.

At the pink stage of flower development, two limbs, 1.5 to 2.5 inches in diameter, were selected and tagged. Spur and one-year-old flowers were counted and recorded separately. At the completion of June drop in July, all fruit originating from spurs or one-year-old wood were counted.

At the normal harvest time, 30 fruit were harvested from each tree: 15 from the upper portion of the tree and 15 on the periphery of the lower tier of branches. Fruit were weighed and the percent of red color on the surface of each apple was estimated to the nearest 10%.

Bloom on lightly pruned trees was heavy and over one-third of this bloom was located on one-year-old wood (Table 1). Dormant-pruned trees had less spur and one-year-old bloom. Fruit set on lightly pruned trees was excessive even though the trees received two chemical thinning treatments that were deemed appropriate for the situation. Fruit set on heavily pruned trees was nearly ideal (30% less than for lightly pruned trees), and the amount of fruit on one-year-old wood was reduced to one-third of the number on lightly pruned trees. Summer pruning of either lightly pruned or heavily pruned trees had no measured effect (data not shown).

Weight of fruit on heavily pruned trees averaged about 158 grams (2.81 inches diameter) while those on lightly pruned trees averaged 136 grams (2.64 inches diameter) (Table 1). No pruning treatment affected percent red color (Table 1), but the color on all fruit was acceptable due to good coloring conditions. Summer pruning did not affect fruit quality (data not shown).

We have established that heavy pruning of Gala achieved several important goals. First, dormant pruning can be used in conjunction with chemical thinning to help reduce crop load to an appropriate level. Furthermore, heavy pruning eliminated much of the fruit set on one-year-old wood, fruit which are small and of inferior quality. Additionally, reduction of this fruit, which is located near the ends of branches, reduces the drooping of branches and shading of fruit below.

Part of the lack of effect of pruning on fruit color may be attributed to sampling technique, which was a random selection of fruit from the top and periphery of the tree. If some fruit from the shaded portion of the tree had been sampled, light pruning probably would have reduced red color primarily by allowing branches to shade each other. Although no data were collected, this result was observed during harvest.

Summer pruning did not appear to be very useful for Gala, since shading is the result of drooping branches, not excessive upright growth. Summer pruning which shortens branches and eliminates some of the drooping will remove some fruit. This type of pruning must be done while fruit are still small so as to reduce bruising caused by fruit falling through the canopy.

The moderately heavy pruning used in this investigation did not stimulate excessive vegetative growth, even in the tops of trees. Return bloom will be determined this spring. Based upon observation of appropriate fruit set and moderate vegetative growth, however, we speculate that heavily pruned trees will have adequate bloom. Heavy set on lightly pruned trees may result in reduced flower bud formation.

We conclude that moderately heavy pruning of Gala is a useful management tool to increase fruit size. Further work will be required to determine possible long-term effects of heavy dormant pruning. Early summer pruning should also be evaluated.

Table 1.
Effects of dormant pruning severity on bloom, fruit set, fruit size, and fruit color of Royal Gala apples in 1994.*

Measurement	Heavy pruning	Light pruning
Bloom density (clusters/cm² limb cross-sectional area)		
Spurs	6.2 b	11.1 a
One-year-old wood	2.5 b	6.8 a
Total	8.7 b	17.9 a
Fruit set (fruit/cm² limb cross-sectional area)		
Spurs	4.3 b	6.1 a
One-year-old wood	0.5 b	1.5 a
Total	4.9 b	7.6 a
Fruit weight (g)	158 a	135 b
Red color (%)	78 a	73 a

*Within rows, means not followed by the same letter are significantly different at odds of 19:1.

International Dwarf Fruit Tree Association
COMPACT NEWS
14 South Main Street
Middleburg, PA 17842

Member 275
WALLACE E. HEUSER
SUMMIT SALES
55826 60TH AVE
LAWRENCE, MI 49064
USA

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CONFERENCE BULLETIN

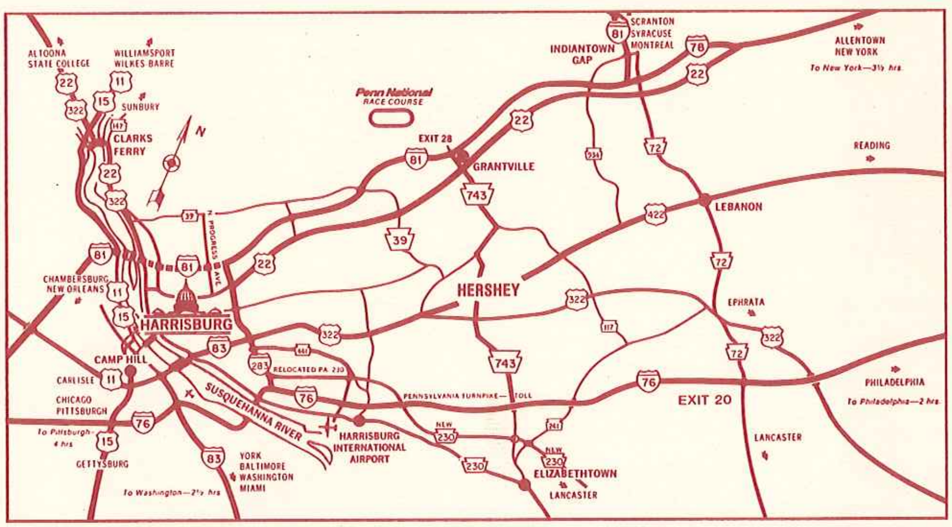
38th Annual IDFTA Conference ▪ February 26 – March 1, 1995 ▪ Hershey, Pennsylvania

No. 1 | Compact News | January 1995

ALL ROADS LEAD TO HERSHEY

For The 38th Annual IDFTA Conference!

Once again, arrangements have been made for another exceptional conference. We've lined up a program that will give you information that will benefit you for the rest of your fruit-growing careers! The 38th Annual IDFTA Conference will be held February 26 through March 1, 1995, at the Hershey Lodge & Convention Center in Hershey, Pennsylvania. We're kicking off the conference Sunday evening with reports on "The Apple Industries in the Mid-Atlantic and South Regions — Each a Unique Blend of Climate, Geography, Varieties, Rootstocks, Systems and Markets."



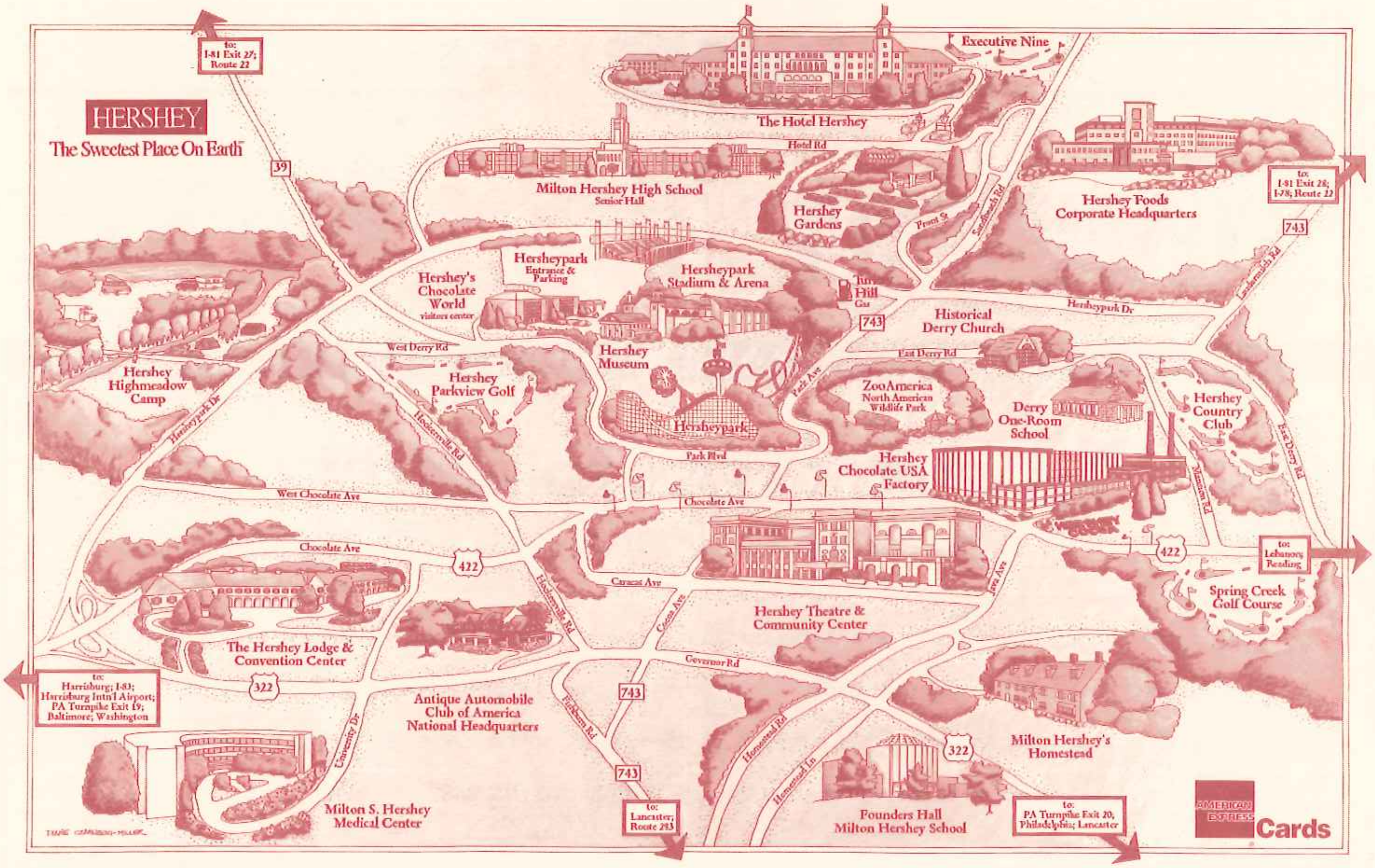
The Robert F. Carlson Distinguished Lecture, "The Challenge of Selecting the Components of an Orchard System," will be presented on Monday morning by Mike Sanders, Horticulturist, British Columbia Ministry of Agriculture, Fisheries and Food, Kelowna, B.C., Canada.

We've scheduled an all-day tour on Tuesday to five outstanding orchards where you'll learn about several techniques in high-density plantings and training systems with a variety of rootstocks. You will also see one of the oldest plantings of Ginger Gold and the famous "Round Barn."

ACCOMMODATIONS

The conference will be headquartered at The Hershey Lodge & Convention Center, West Chocolate Avenue & University Drive, Hershey, Pennsylvania 17033.

This award-winning destination is located in the heart of Central Pennsylvania's rolling hills, twenty minutes east of Harrisburg, the state capital. ➤

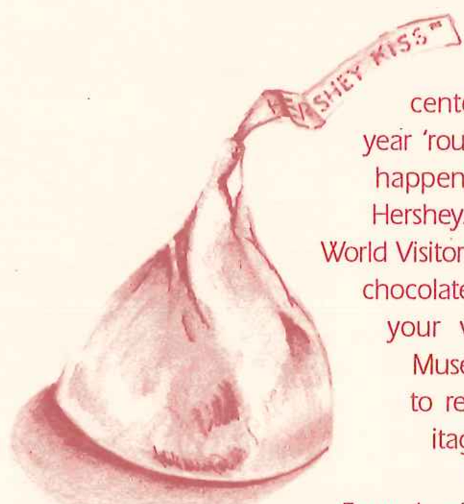


Hershey is easily accessible by major highways from New York (3-1/2 hours), Baltimore (1-1/2 hours), and Philadelphia (2 hours). Courtesy van service from Harrisburg International Airport and Harrisburg Amtrak Terminal is available.

Spacious, comfortable rooms have Mobil Three Star and AAA Three Diamond ratings, and the meeting and banquet facilities are superior.

For fine dining, The Tack Room features nouvelle cuisine in elegant surroundings. The Hearth features regional country cooking and a warm atmosphere highlighted by a large, open fireplace. The Copper Kettle is an informal setting for breakfast, lunch or dinner. J.P. Mallard's Lounge has a disc jockey, pool tables and large screen televisions for evening entertainment. The Forebay Lounge offers a raw bar and jumbo deli-style sandwiches in a quiet atmosphere.

Recreational facilities include a spacious indoor pool, whirlpool and saunas, adult fitness center, and indoor tennis adjacent to property. Also first-run movies are shown nightly in the Lodge Cinema.



Hershey, Chocolate Town U.S.A., is the center of attractions. All year 'round there is something happening for everyone in Hershey. Start with Chocolate World Visitors' Center and see how chocolate is made. Then make your way to the Hershey Museum of American Life to relive our historical heritage. Or find out what there is to learn at Founders' Hall of the Milton Hershey School.

In Hershey you're only a short drive from historic Gettysburg and the famous outlet shops of Lancaster and Reading. And everywhere you go in Central Pennsylvania you're surrounded by the warmth and hospitality of our scenic Pennsylvania Dutch Country.

(Rates, Reservations, and Banquet information is continued on page 7)

1995 IDFTA CONFERENCE SPOUSES' TOUR

Longwood Gardens and Brandywine River Museum

Monday, February 27, 1995

The spouses' tour is scheduled to depart Monday morning at 8:00 a.m. and arrive back at The Hershey Lodge & Convention Center at 5:00 p.m. The cost is $25.00 which includes transportation and admission to both sites. Lunch will be on your own at Longwood Gardens. To make reservations, please fill out the registration form which is enclosed with this newsletter.

LONGWOOD GARDENS, located in Kennett Square, PA, is a garden for all seasons and sure to delight anyone who loves exquisite flowers, majestic trees, and opulent architecture. From January through April, Longwood Gardens "welcomes spring" indoors with acacias, daffodils, hyacinths, orchids, organ concerts, palms, roses and tulips.

On the banks of the Brandywine River in historic Chadds Ford, the **BRANDYWINE RIVER MUSEUM** is a unique showcase for American Art. This Civil War era grist mill converted into a modern museum is famous for its unparalleled collection of art by the Wyeth family and for its fine collections of American illustration, still life, and landscape painting. □

1995 IDFTA CONFERENCE ORCHARD TOUR

South Central Pennsylvania and Northern Maryland

Tuesday, February 28, 1995

An all-day orchard tour is scheduled on Tuesday. The cost of the tour is $25.00 which includes transportation, snacks, drinks and lunch. A super continental breakfast will be available starting at 6:00 a.m. so there will be plenty of time to catch the bus at 8:00 a.m. Two tours (Tour A and Tour B) will be conducted simultaneously and both will visit all five locations.To make reservations, please fill out the registration form which is enclosed with this newsletter.

The buffet style lunch will be held at the Biglerville Firehall, Biglerville. It will include ham, fried chicken, potato salad, macaroni salad, rolls and butter, applesauce, green beans, cake, and coffee, tea, water or lemonade.

THE SUPER CONTINENTAL BREAKFAST

Assorted Chilled Fruit Juices and Vegetable Juices
Danish Pastry, Croissants and Muffins
Butter, Assorted Preserves
Fluffy Scrambled Eggs
Bacon or Sausage
Coffee, Decaffeinated Coffee
Assorted Bigelow and Lipton Teas
$10.00

We will be visiting one orchard in Thurmont, MD, and four orchards in Adams County, PA. They are:

R&L ORCHARDS INC. – Mark Rice will show us his high density plantings with Gala, Fuji, Red Delicious and other varieties trained to a modified vertical axis system and his Asian pear blocks.

HOLLABAUGH BROS. ORCHARDS, INC. – The Hollabaugh brothers will show us their high density apple blocks using M.26 and M.9 rootstocks. They also have one of the oldest plantings of Ginger Gold.

JAMES R. OYLER FRUIT FARM – Dr. Jim Oyler will show us his high density modified central leader training system with Red Delicious, Empire, Mutsu, Golden Delicious and other varieties.

KNOUSE FRUITLANDS, INC. – Brian Knouse will show us his high density orchard blocks with a modified central leader training system. We will also see the famous "Round Barn."

CATOCTIN MT. ORCHARD – Harry and Bob Black will show us their training of Gala, Fuji, and other varieties on a modified central leader system using various rootstocks. □

APPLE ROOTSTOCK DESCRIPTIONS—PART II TEN ROOTSTOCKS SIMILAR TO MALLING 9 IN VIGOR

Bruce H. Barritt
Washington State University, Tree Fruit Research and Extension Center
Wenatchee, WA 98801

This is the second part of an article describing apple rootstocks. Part I appeared in Compact News (November, 1994) and included the following rootstocks which are more dwarfing than M.9E: M.27E, P.16, P.22, V.3, B.146, B.491, G.65 and Mark. Rootstock descriptions are presented here for 10 rootstocks in the M.9E vigor range. They are listed in order of increasing tree vigor, although differences in closely ranked rootstocks may be small.

P.2

P.2 is a dwarfing rootstock from the Polish breeding program that originated from a cross of M.9 X Common Antonovka. P.2 produces a tree approximately 20 percent smaller than M.9E in size. It is precocious and has high yield efficiency, similar to M.9E. Fruit size is similar to M.9E. It requires support. P.2 is very winter hardy, similar to P.22, O.3, B.9 and M.26, and hardier than M.9. It is resistant to collar rot, susceptible to fire blight and woolly apple aphid. It is more difficult to propagate in stoolbeds than M.9. It does not produce root suckers and has few burrknots. P.2 could be a potentially valuable winter hardy rootstock in the M.9E vigor range if its poor propagation characteristics could be improved.

CG.10

Cornell-Geneva 10 is a dwarfing rootstock from the Cornell University breeding program at Geneva, New York. It is an open-pollinated seedling of the very dwarfing M.8 rootstock. CG.10 produces a tree slightly smaller than trees with M.9E. It is less precocious and has had lower yield efficiency than M.9E. Fruit size is equal to or slightly less than M.9E. It requires support. It has root suckers and is susceptible to fire blight. It is easy to propagate and has few burrknots. CG.10 is from an early series of Cornell rootstocks and is no longer considered a potential replacement for M.9.

M.9

Malling 9 is the worldwide standard dwarfing rootstock and one of the original Malling series (also known as Type IX, EM.IX, EM.9, M.9 EMLA and Jaune de Metz). The virus-free M.9E clone produces a tree approximately 35 percent smaller than M.26E (tree size for M.26E = 100, for M.9E = 65). Many subclones (strains) of M.9 exist today, the result of both heat treatment to rid the original clone of viruses and selection by nurserymen for ease of stoolbed propagation. M.9 clones vary somewhat in the degree of dwarfing imparted to the scion but all clones produce trees substantially larger than M.27E and significantly smaller than M.26E. The original M.9 clone containing viruses produces a tree approximately 25 percent smaller than the virus-negative M.9E clone. M.9 Fleuren 56 is a less vigorous clone than M.9E. With the exception of M.9 Fleuren 56, the variation in tree size among the following M.9 clones is relatively small: EMLA, NAKB T.337, Nicolai (Nic) 29, Pajam 1 (Lancep) and Pajam 2 (Cepiland). There is a much greater opportunity to alter tree size with M.9 by varying the height of the bud union above the soil line in the orchard than by choosing among the virus-free M.9 clones.

M.9E is very precocious and has high yield efficiency. The influence of rootstock on fruit size is usually small; however, scion varieties on M.9E produce consistently large fruit size. M.9 is relatively difficult to propagate in stoolbeds. Its roots are brittle and break easily. It has some burrknots but fewer than Mark and M.26 and produces few root suckers. M.9 is highly resistant to collar rot but is susceptible to fire blight and woolly apple aphid. In areas such as Poland and Russia with extremely cold winter temperatures, M.9 has not been adequately hardy. However, in most fruit-growing districts in North America, M.9 has shown little injury and has not shown any more injury than the extensively planted M.7 which is also considered to lack winter hardiness. M.9 appears to be sufficiently winter hardy for fruit districts that have successfully grown M.7.

M.9 is the most extensively planted rootstock worldwide. It is the rootstock that has made high density orchards possible. In western Europe over 90 percent of all trees planted are on M.9. The virus-free clones of M.9 are now being extensively planted for high density orchards in several North American fruit districts.

V.1

Vineland 1 is a new dwarfing rootstock from the Vineland, Ontario, breeding program. It is an open pollinated seedling of the crabapple variety Kerr (Dolgo X Haralson). The pollen parent is believed to be M.9. Trees on V.1 are similar in size to M.9E and, like M.9E, are precocious with high yield efficiency. Fruit size is similar to M.9E. V.1 produces few root suckers. Trees on V.1 require support. Its winter hardiness and disease and insect resistance are not known. Data for tree size and productivity for V.1 are preliminary as experience is limited to North American evaluations in Ohio and Washington.

CG.16

Cornell-Geneva 16 is a dwarfing rootstock from the Cornell University breeding program at Geneva, New York. It originates from a cross of Ottawa 3 X *Malus floribunda.* CG.16 produces a tree similar in size to M.9. Scion varieties on CG.16 are precocious and very productive. It is resistant to fire blight and collar rot and is susceptible to woolly apple aphid. Root suckers and burrknots are rare. Roots are less brittle than M.9. CG.16 is a new rootstock that has not yet been planted in North American NC-140 trials.

J9

Jork 9 is a dwarfing rootstock from Germany that is an open pollinated seedling of M.9 and produces a tree slightly smaller than virus-free M.9. It is as precocious and productive as M.9. It is more easily propagated and has greater winter hardiness than M.9. Burrknots are common, a situation similar to M.26. It is extremely susceptible to fire blight. J9 has not been extensively tested in North America.

B.9

Budagovsky 9 is a dwarfing rootstock bred in Russia from the cross of M.8 X Red Standard. It is also known as Bud.9, Red-leafed Paradise 9 and Paradizka Krasnolistnaya 9. Its leaves are red. Tree size of B.9 is similar to or slightly larger than M.9E. It is a precocious rootstock with high yield efficiency. Fruit size is large and similar to M.9E. It requires support. B.9 is highly resistant to collar rot and susceptible to fire blight and woolly apple aphid. It is easier to propagate in stoolbeds than M.9. B.9 has excellent winter hardiness, similar to M.26, O.3, P.2 and P.22 and much greater than M.9. It produces few suckers or burrknots. B.9 is a promising dwarfing winter-hardy rootstock. Trees on B.9 are now being propagated by North American nurseries.

O.3

Ottawa 3 is a dwarfing rootstock bred in Ottawa, Canada, that originated from a cross of M.9 with the hardy crabapple variety, Robin. O.3 produces a tree approximately halfway between M.9E and M.26E in tree size. It is precocious with high yield efficiency and has large fruit size similar to M.9E. It requires support. O.3 is very winter hardy. It is resistant to collar rot but susceptible to fire blight and woolly apple aphid. O.3 is sensitive to stem grooving virus. Trees are extremely stunted if the O.3 rootstock becomes infected with this virus. For this reason, only virus-free scion wood should be used with O.3. It has few burrknots or root suckers. O.3 has been extremely difficult to propagate in stoolbeds. O.3 is an excellent cold hardy dwarfing rootstock but its commercial use has been limited by difficulties with propagation.

Bemali

Bemali is a dwarfing rootstock bred and selected in Sweden from a cross of Mank's Codlin X M.4. Its yield efficiency and fruit size have been less than M.9. It is reportedly resistant to woolly apple aphid and very resistant to fire blight. It produces a tree between M.9 and M.26 in size. It is easily propagated in stoolbeds. Bemali has not been widely evaluated in North America.

MAC.39

Michigan Apple Clone 39 is a dwarfing rootstock from the Michigan State University breeding program. It is a seedling of M.11. MAC.39 produces a tree between M.9E and M.26E in size although usually closer to M.26E. MAC.39 is less precocious and less yield efficient than M.9E and for both traits is similar to M.26E. Fruit size is similar to M.9E and M.26E. It requires support. MAC.39 has few burrknots and does not produce root suckers. Sensitivity of MAC.39 to collar rot, woolly apple aphid and fire blight has not been determined.

This article will be continued (Part III) in an upcoming issue of Compact News. The following rootstocks with tree vigor ranging from M.26 to M.7 will be described in Part III: C6, G.11, M.26, V.2, V.7, CG.24, M.7, G.30, OAR.1, P.1 and V.4. □

OVERSEAS SPEAKERS

Sharing a Wealth of Information and Experience

DR. ALOJZY CZYNCZYK, an authority on apple rootstocks, is head of the Department of Breeding, Cultivar Trials, Orchard and Nursery Management and Small Fruit Culture at the Research Institute of Pomology and Floriculture in Skierniewice, Poland. He was a featured speaker at the 1984 IDFTA conference in Grand Rapids, Michigan. At that meeting he spoke about hardy dwarfing rootstocks (P.2, P.22, etc.) from Poland and the performance of dwarfing rootstocks and interstems. At the Hershey conference, Dr. Czynczyk will speak about the newest group of winter hardy and dwarfing rootstocks from the Polish breeding program as well as the Polish apple industry as it moves into a free market economy.

PETER TRILOFF is a pest management adviser with a large fruit grower cooperative (Marktgemeinschaft Bodenseeobst EG) in Friedrichshafen in the Bodensee fruit district of southern Germany. He recently presented a paper on pesticide application methods at the South American symposium on temperate fruit production in Brazil. At Hershey he will speak about fruit growing in the Bodensee area and about Integrated Fruit Production (IFP) techniques designed to reduce pesticide residues on fruit and minimize the negative impact on the environment of chemicals used in fruit growing.

DR. WALTER WALDNER is head of the South Tyrolean Tree Fruit and Grape Advisory Service (Südtiroler Beratungsring für Obst- Und Weinbau) located in Lana, Italy. He will speak about the establishment and management of new high density orchards, including discussions of tree quality, orchard systems, tree support systems and pruning and training techniques. In a second presentation, he will describe orchard management techniques used to meet the European Integrated Fruit Production requirements for minimizing the environmental impact of agricultural chemicals. European consumers are demanding that fruit be produced with as few pesticides (insecticides, fungicides and herbicides) as possible and the comprehensive IFP strategies are designed to meet that goal. □

ROBERT F. CARLSON DISTINGUISHED LECTURE

To be Presented by Mike Sanders

Mike is the Tree Fruit Specialist with the British Columbia Ministry of Agriculture, Fisheries and Food (BCMAFF) and is located in Kelowna, British Columbia. He has over 25 years of experience as a horticulturist with the B.C. tree fruit industry and has been instrumental in the rapid transition of B.C. orchards to high density and super high density orchard systems. He is editor of the B.C. tree fruit industry publication "Tree Fruit Leader." In his presentation he will discuss matching the orchardist's production system (rootstock, tree density, support system, etc.) with the local climate, soils, land use regulations, market opportunities and economic factors.

CALL FOR RESEARCH PROPOSALS

The IDFTA Board of Directors has allocated $30,000 for 1995 research projects. "Guidelines for Research Proposals" and "Application for Research Funding" forms can be obtained from the IDFTA Education Office (Bruce Barritt, IDFTA Education Director, 1100 N. Western Avenue, Wenatchee, WA 98801; phone 509-663-8181, ext. 233; FAX 509-662-8714). Given the limited funding available and anticipated number of worthy projects, individual proposals should be for less than $5,000. The deadline for submitting proposals is January 25, 1995.

ALL ROADS LEAD TO HERSHEY

(continued from page 2)

RATES & RESERVATIONS

Rooms have been reserved for the IDFTA, but your prompt response in making reservations will be necessary to ensure that you have a room. All reservations should be received by January 31, 1995. Any reservations received after that date will be accepted on a space available basis and may be subject to regular hotel rates.

Special convention rates have been arranged and are as follows:

- Single $78.00
- Double $78.00

Room reservations are to be made directly with The Hershey Lodge & Convention Center using the enclosed registration card or by calling 1-800-533-3131. Due to time limitations, overseas and Canadian members are encouraged to call the above mentioned number or fax your reservation to 717-534-8666.

BANQUET

The annual conference banquet will be held on Monday evening, February 27. Social hour starts at 6:30 p.m. and dinner will be served at 7:15 p.m. We will be enjoying a Pennsylvania Dutch Buffet.

The cost of the banquet is $28.00 per person. Please make reservations by filling out the registration form enclosed with this newsletter. □

PENNSYLVANIA DUTCH BUFFET

Vegetable Soup / Chicken Pot Pie
Sliced Pork on Sauerkraut / Dutch Rope Sausage
Steamship Round of Beef (Carved in Room)
Potato Filling / Cope's Dried Corn
Green Beans with Bacon Bits
Carrots / Sweet Potatoes
Rolls and Butter

Sweets & Sours

Chow-Chow / Apple Butter / Cottage Cheese
Pickled Beets / Corn Relish / 3 Bean Salad
Sweet Pickle Chips / Pepper Cabbage / Apple Sauce
Dried Apricots / Pickled Eggs
Mustard Relish / Cole Slaw

Desserts

Shoo-fly Pie / Apple Pie / Cherry Pie
Chocolate Cake / Rice Pudding
Beverage

CONFERENCE PROGRAM

Registration in the Convention Center Lobby

Sunday, February 26 2:00 – 8:00 p.m.
Monday, February 27 8:00 a.m. – 5:00 p.m.

SUNDAY EVENING, FEBRUARY 26

Session Chairperson, Dr. Steve Blizzard, IDFTA Board Member, Kerrville, TX

The Apple Industries in the Mid-Atlantic and South Regions — Each a Unique Blend of Climate, Geography, Varieties, Rootstocks, Systems and Markets

7:00 New Jersey
Professor Win Cowgill, Rutgers Cooperative Extension, Flemington, NJ

7:20 Pennsylvania
Dr. George Greene, Pennsylvania State University, Biglerville, PA

7:40 Virginia
Dr. Rich Marini, Virginia Tech., Blacksburg, VA

8:00 North Carolina
Dr. Mike Parker, North Carolina State University, Raleigh, NC

8:20 Georgia
Dr. Stephen Myers, University of Georgia, Athens,GA

MONDAY MORNING, FEBRUARY 27

Session Chairperson, Fritz Wafler, IDFTA Board Member, Wolcott, NY

8:30 Welcome to 38th Annual IDFTA Conference
Jack Pheasant, IDFTA President, Wenatchee, WA

Program, Orchard Tour, and Summer Tour Updates
Bruce Barritt, IDFTA Education Director, Washington State University, Wenatchee, WA

8:40 The Challenge of Selecting the Components of an Orchard System
Robert F. Carlson Distinguished Lecture
Mike Sanders, Horticulturist, British Columbia Ministry of Agriculture, Fisheries and Food, Kelowna, B.C., Canada

9:20 Apple Growing in the Bodensee District of Germany—State of the Art, Facts, Trends and Impressions
Peter Triloff, Pest Management Advisor, Marktgemeinschaft Bodenseeobst (Bodensee Fruit Marketing Cooperative), Friedrichshafen, Germany

STAND UP AND STRETCH

10:00 **Challenges in Moving to High Density Apple Systems in New York—A Grower Panel**
Moderator—Steve Hoying, Area Extension Specialist, Cornell Cooperative Extension, Newark, NY
Mike Madison, Belle Terre Farms, Sodus, NY
Jim Peters, Church Road Farms, Williamson, NY
Randy Paddock, Glendale Farms, Knowlesville, NY

10:30 Present Trends in Planning, Establishing and Managing Apple Orchards in South Tyrol, Italy
Dr. Walter Waldner, South Tyrolian Tree Fruit and Grape Advisory Service, Lana, Italy

11:10 Based on Economic Analysis, Which Are the Most Successful Orchard Systems — Slender Spindle, V-Spindle, French Axe, 4-Wire Trellis or Y-Trellis?
Alison DeMarree, Area Extension Specialist, Cornell Cooperative Extension, Newark, NY

MONDAY AFTERNOON, FEBRUARY 27

Session Chairperson, Dennis Courtier, IDFTA Board Member, Lake City, MN

1:30 Pomology 101: Physiology and Phinances — Orchard Management to Reduce Costs and Improve Productivity
Dr. Curt Rom, University of Arkansas, Fayetteville, AR

2:10 Performance of New Dwarfing Rootstocks in France
Guy Ligonniere, Davodeau Ligonniere Nursery, Angers, France

2:30 Apple Growing in Poland
Dr. Alojzy Czynczyk, Pomology Research Institute, Skierniewice, Poland

STAND UP AND STRETCH

3:10 Getting the Nursery Tree You Want—Advantages and Disadvantages of Growing Trees in Place, Producing Your Own Trees and Purchasing Trees From a Nursery
Karen Maib, Washington State University Tree Fruit Extension Agent, Columbia Basin, WA

3:30 **Performance of Apple Orchard Systems in the 1990 NC-140 Trial**
Moderator—Dr. Terence Robinson, NYAES, Cornell University, Geneva, NY

Experience in Virginia with Slender Spindle, Vertical Axis and Central Leader on Several Rootstocks with Delicious and Empire
Dr. John Barden, Virginia Tech, Blacksburg, VA

Performance and Labor Requirements for Orchard Systems in the Michigan NC-140 Trial
Dr. Ron Perry, MSU, East Lansing, MI

Production and Light Interception with Empire and Jonagold in New York
Dr. Terence Robinson, NYAES, Cornell University, Geneva, NY

Discussion led by moderator

MONDAY EVENING, FEBRUARY 27

6:30 Social Hour

7:15 Awards Banquet
Master of Ceremonies, Dr. Steve Blizzard, IDFTA Board Member, Texas Hill Country Orchards, Kerrville, TX

Presentation of IDFTA Grower, Extension and Research Awards

TUESDAY, FEBRUARY 28

8:00 All day Orchard Tour in Adams County

TUESDAY EVENING, FEBRUARY 28

Session Chairperson, Mitch Lynd, IDFTA Board Member, Pataskala, OH

7:00 Growing Apple Trees Above the Soil
Dr. Steve Blizzard, Texas Hill Country Orchards, Kerrville, TX

7:25 Development of Integrated Fruit Production (IFP) in South Tyrol, Italy
Dr. Walter Waldner, South Tyrolian Fruit and Grape Advisory Service, Lana, Italy

8:05 Measuring the Environmental Impact of Pesticides in Ontario Apple Orchards
Bernie Solymar, Tree Fruit Advisor, Ministry of Agriculture, Food and Rural Affairs, Simcoe, Ontario

8:35 Evaluation of Apple Tree Training Techniques for High Density Orchards in North Carolina
Dr. Mike Parker, North Carolina State University, Raleigh, NC

WEDNESDAY MORNING, MARCH 1

Session Chairperson, Tom Auvil, IDFTA Board Member, Orondo, WA

8:30 **Sprayer Technology for High Density Orchards**
Moderator—Dr. Henry Hogmire, Entomologist, West Virginia Experiment Station, Kearneysville, WV

Tunnel Sprayer Performance in West Virginia
Dr. Henry Hogmire, Kearneysville, WV

Tunnel Sprayer Configurations for Dwarf Orchards
Dr. Donald L. Peterson, Agricultural Engineer, USDA-ARS Appalachian Fruit Research Station, Kearneysville, WV

Experience with a Tunnel Sprayer in Our High Density Orchards
Darrel Oakes, IDFTA Vice President and Grower, Lyndonville, NY

Discussion led by Moderator

9:35 Integrated Fruit Production (IFP)—More than Safe Chemicals
Peter Triloff, Pest Management Advisor, Marktgemeinschaft Bodenseeobst, Friedrichshafen, Germany

STAND UP AND STRETCH

10:20 The Critical Factors which Influence Orchard System Profitability—Price, Early Production, a No-Crop Year, Mature Yields, and Land Cost
Alison DeMarree, Area Extension Specialist, Cornell Cooperative Extension, Newark, NY

10:50 New Dwarfing Apple Rootstocks from the Polish Breeding Program
Dr. Alojzy Czynczyk, Polish Apple Rootstocks and Their Performance, Skierniewice, Poland

11:30 Topworking Trees—Timing, Placement and Aftercare of Grafts
Rick Maib, Orchard Manager, Washington Fruit and Produce, Columbia Basin, WA

WEDNESDAY AFTERNOON, MARCH 1

Session Chairperson, Darrel Oakes, IDFTA Vice President, Lyndonville, NY

1:30 **Orchardists Compare the Economics of Slender Spindle, Y-Trellis, French Axe, V-Spindle and Vertical Trellis**
Moderator—Alison DeMarree, Area Extension Specialist, Cornell Cooperative Extension,Newark, NY
Dan Donahue, DeeJay Orchards, Geneva, NY
George Lamont, Lamont Fruit Farms, Albion, NY
Ted Furber, Cherry Lawn Orchards, Sodus, NY

Discussion led by Moderator

2:20 Apple Processing and High Density—Do They Mix?
Dr. Rob Crassweller, Pennsylvania State University, University Park, PA

STAND UP AND STRETCH

2:40 **Ten-year Performance of Apple Rootstocks in the NC-140 Trial**
Moderator—Dr. Dave Ferree, Horticulturist, Ohio Agriculture Research and Development Center, Wooster, OH

Summary of Rootstock Performance with Starkspur Supreme Delicious at 30 Sites
Dr. Dave Ferree, OARDC, Wooster, OH

Influence of Rootstock on Fruit Ripening and Maturity
Dr. Wes Autio, University of Massachusetts, Amherst, MA

Aspects of Performance in the Mid-South—Foliar Nutrition, Shoot Growth and Pruning Requirements
Dr. Curt Rom, University of Arkansas, Fayetteville, AR

Discussion and Questions

3:40 **Success with High Density Orchard Management in British Columbia's Okanagan Valley—Site of the 1996 IDFTA Conference**
Moderator—Mike Sanders, Horticulturist, Kelowna, B.C.
Jamie Kidston, Grower, Vernon, B.C.
Richard Bullock, Grower, Kelowna, B.C.
Bruce Currie, Grower, Peachland, B.C.
Jake van Westen, Grower and IDFTA Board Member, Naramata, B.C.

Discussion led by Moderator

IDFTA CALENDAR

June 24-July 8, 1995	IDFTA European Study Tour
February 25-29, 1996	IDFTA Conference, British Columbia

IDFTA EUROPEAN STUDY TOUR

June 24 – July 9, 1995

The 16-day IDFTA Study Tour will feature visits to commercial orchards and research centers in The Netherlands, Belgium, the Bodensee district in southern Germany and Switzerland and the South Tyrol district in Italy. The emphasis will be on intensive orchard systems, including evaluation of rootstocks, tree density, support systems and pruning and training techniques. Specific goals are to:

- Become familiar with European orchard practices including herbicide use, irrigation, nutrition, support systems, pest management, fruit thinning, pruning and training.
- Study Integrated Fruit Production (IFP) practices designed to reduce the impact of orcharding on the environment. IFP dramatically reduces pesticide usage.
- Learn the characteristics of fruit varieties and rootstocks grown in Europe.
- Observe the high density Dutch slender spindle system and its modifications in tree height and 'V' canopy design when grown in Belgium, Germany, Switzerland and Italy.
- Learn about growing the extremely high density super spindle system with trees planted in a berm, on the ground, rather than in the ground.
- Become familiar with European pomology research on tree training systems, rootstocks, fertigation, tunnel sprayers and nursery tree quality.
- Learn the characteristics and advantages of high quality nursery trees.

TRAVEL ARRANGEMENTS

The technical visits have been organized by Dr. Bruce Barritt, Horticulturist at the Washington State University Tree Fruit Research and Extension Center, Wenatchee, and IDFTA Education Director. Tour arrangements are being made by Curtis-C Travel Inc., P.O. Box 7188, East Wenatchee, WA 98802. Bob Curtis, owner of Curtis-C Travel, has escorted six previous tree fruit study tours and will travel with the tour participants in Europe. Trans-Atlantic travel is by air using coach class service. Surface travel in Europe is by a restroom-equipped, chartered motorcoach. Hotels are first class with private bath. All breakfasts are included. Spouses are welcome, although a special program is not planned for spouses. Curtis-C Travel will be pleased to make individual arrangements for post-tour travel or for those who may wish to participate in just one week of the study tour.

INFORMATION, COSTS AND REGISTRATION

Information about travel arrangements can be obtained by calling Bob Curtis, Curtis-C Travel, 509-884-3539 or 1-800-562-2580. For additional information about the technical visits, please call Bruce Barritt at 509-663-8181, ext. 233 (FAX: 509-662-8714). ➤

(Clip or copy and mail with your deposit to Curtis-C Travel, P.O. Box 7188, East Wenatchee, WA 98802)

Please enroll me/us in the 1995 IDFTA Tree Fruit Study Tour of Europe:

Name(s) ______________________________

____

Address ______________________________

City/State/Zip ______________________________

I will room with ______________________________

I prefer a single room ______________________________

Phone (work) ______________________________

FAX ______________________________

Phone (home) ______________________________

Smoker__________ Non-smoker__________

Please assign a roommate ______________________________

A deposit of $_____ is included for _____ person(s). A deposit of $200.00 per person must accompany this application.

The cost per person based on two persons sharing a room for the 16-day tour is $3395 from the West Coast (Seattle), $3335 from the Midwest (Chicago) and $3315 from the East Coast (New York). The supplement for a single room is $375. The cost is based on a minimum of 25 persons and may change slightly if drastic currency fluctuations occur. There may be minor changes in the itinerary as arrangements with European hosts are finalized.

To register for the study tour, complete the registration form and send it, along with a $200 per person deposit, to Curtis-C Travel, P.O. Box 7188, East Wenatchee, WA 98802. Full payment will be due April 25, 1995, 60 days prior to departure. □

ITINERARY

Saturday — **June 24**
Depart U.S. for overnight flight to Europe

Sunday — **June 25**
Arrive Amsterdam; overnight Hotel Sofitel, Amsterdam

Monday — **June 26**
Visit orchards on land reclaimed from the sea in the Flavoland polder; tree training of slender spindle and super spindle, planting on berms, trickle irrigation; overnight Hotel Sofitel, Amsterdam

Tuesday — **June 27**
Research station and orchard visits in central Holland and Zeeland; rootstocks, tree density, nursery tree quality and tunnel sprayer technology; overnight Hotel Goes, Goes

Wednesday — **June 28**
Research station and high density orchard visits in Belgium; overnight Hotel Beaumont, Maastricht

Thursday — **June 29**
Orchard and nursery visits in Belgium and The Netherlands; overnight Hotel Beaumont, Maastricht

Friday — **June 30**
Commercial orchard and nursery visits to study pruning and training of traditional slender spindle and super spindle orchards and to see techniques for matching nursery tree quality with orchard systems; afternoon travel to Heidelberg, Germany, overnight Hotel Zum Ritter St. Georg

Saturday — **July 1**
Free day to explore Heidelberg, the famed university town and its castle; overnight Hotel Zum Ritter St. Georg, Heidelberg

Sunday — **July 2**
Morning drive to Meersburg, Germany, on the Bodensee; afternoon free to explore the castle and old town on the shores of the Bodensee; overnight Hotel Zum Schiff, Meersburg

Monday — **July 3**
Demonstrations of Integrated Fruit Production and management techniques for super spindle and slender spindle orchards on the German (north) shore of the Bodensee; overnight Hotel Zum Schiff, Meersburg

Tuesday — **July 4**
Orchards and research station visits to study 'V' systems and hail netting on the Swiss (south) shore of the Bodensee (Lake Constance); overnight Hotel Zum Schiff, Meersburg

Wednesday — **July 5**
Morning drive through the Austrian and Italian Alps to South Tyrol, Italy; afternoon orchard visits in the high Vinschgau region; overnight Hotel Meranerhof, Merano

Thursday — **July 6**
Orchard and research station visits to study tree density, 'V' canopy design, tree training and Integrated Fruit Production techniques in the Adige Valley near Bolzano; overnight Hotel Meranerhof, Merano

Friday — **July 7**
Morning orchard visits near Merano; afternoon drive through the spectacular Italian and Swiss Alps to Pontresina, near St. Moritz, Switzerland; overnight Sport Hotel, Pontresina

Saturday — **July 8**
Morning free to enjoy the Swiss alpine scenery; afternoon drive to Zurich; overnight Hotel Welcome Inn, near Zurich airport

Sunday — **July 9**
Depart for U.S., arrive the same day

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COMPACT NEWS

A Periodic Newsletter of the International Dwarf Fruit Tree Association

No. 3 June 1995

IS THERE A "RIGHT" ORCHARD SYSTEM FOR YOU?

Bruce H. Barritt
Washington State University ▪ Tree Fruit Research and Extension Center ▪ Wenatchee, WA 98801
(from 1995 Fruit Tree Catalog and Grower Reference Guide, Adams County Nursery)

We will start with the assumption that your goals for an orchard management system are relatively high, early production, high sustained production, and fruit of high quality for the intended market. Selecting an orchard system will be based on your understanding of the importance of 1) sunlight interception by the trees in the orchard, 2) sunlight distribution within tree canopies and 3) appropriate pruning and training techniques to achieve adequate sunlight interception and distribution.

An orchard system is a management program for the establishment and maintenance of tree fruit plantings based on the successful integration of the following horticultural components: tree quality, rootstock, tree density and arrangement, support systems and pruning and training techniques. For example, the pedestrian slender spindle orchard system includes the following well-integrated components: a branched tree, M.9 rootstock, high tree density, a pole for support, and training as a 7-foot-tall pyramid-shaped central leader tree. Other examples of orchard systems, each with a unique mix of integrated components, include vertical axis, Solen, Tatura trellis, Lincoln canopy, Penn State low trellis, super spindle, 'Y' and 'V' trellis, slender pyramid, freestanding central leader, hybrid tree cone (HYTEC) and Ebro trellis. Are any of these appropriate for you or should you develop your own system?

LIGHT INTERCEPTION

Sunlight interception by orchard trees is the single most important factor determining orchard productivity and therefore is a critical factor in the design of an orchard system. It is important to intercept approximately 70% of the sunlight striking the orchard area as early in the orchard's life as possible. This means that 70% of sunlight strikes the trees and 30% reaches the orchard floor. Light which strikes the orchard floor is, for the most part, wasted. Light interception is critical because it is positively correlated with fruit production per acre. Young orchards with high light interception have higher production in their early years than young orchards with low light interception. There are four approaches to achieving high light interception with young orchards: 1) plant high tree densities, 2) plant large, well-branched trees, 3) promote rapid and healthy canopy growth, 4) don't overprune trees.

Tree density. The total leaf area in a young orchard and the resulting amount of intercepted sunlight are directly related to planting density. An orchard with 1000 trees/acre will intercept twice as much sunlight the year of planting and for several years after as an orchard with 500 trees/acre. Tree density has a greater impact on light interception and therefore on production per acre than tree quality, the pruning and training system or the support system.

Branched trees. Achieving rapid canopy development in the orchard starts in the nursery. Well-branched (feathered) trees intercept more sunlight and therefore have higher production in the early years than unbranched trees. Although whips (unbranched trees) and small caliper trees are less expensive than larger branched trees, they generally take longer to achieve full canopy development and therefore are slow to begin bearing.

Healthy canopy. A canopy of small, diseased or infected leaves or short shoots intercepts less sunlight than a canopy of vigorous shoots with large, healthy leaves. The development of healthy leaf area with young trees depends on careful attention to pest management (including fumigation if necessary), fertility, weed control and water management.

Pruning. Light interception will not increase rapidly in young orchards if trees are overpruned. Pruning is a dwarfing process and smaller trees intercept less sunlight than larger trees. It is important to let trees achieve a reasonable but not excessive height. Trees which are 10 feet tall intercept more sunlight than 7-foot-tall trees if they have the same width at the base and are planted at the same tree density. However, it is a concern that excessively tall trees often have poor light distribution (see below).

If orchardists can be faulted during the establishment and management of young apple orchards, it is that their expectations are not high enough for tree growth and canopy development. Without having rapid and extensive canopy growth in the early years, light interception cannot be increased sufficiently to achieve high, early production.

LIGHT DISTRIBUTION

Light distribution refers to the amount of sunlight reaching a particular location within the canopy. Concern about the distribution of sunlight to all parts of the canopy increases as trees age. In general, any portion of a canopy that is more than 3 feet from the outside of the canopy (from full sunlight) can suffer the unfortunate consequences of shading. The following sequence of events occurs as the level of shading increases: first, fruit color decreases, then as shade increases fruit size decreases, followed by decreases in fruit set, and finally, in deep shade, flower bud development stops. To prevent these disasters, 30 to 50% of full sunlight is needed in all parts of the canopy. The consequence of excessive shade is first a decline in fruit quality, then a decline in fruit quantity.

It is necessary to prune and train trees to ensure that sufficient sunlight reaches all parts of the canopy. This is achieved by: 1) removing extra limbs and limbs that become too large (even if they have a lot of fruit) and 2) pruning limbs to ensure that all parts of the canopy are less than 3 feet from full sun. Tree canopies must be open and relatively thin. Trees which are too thick or too tall will usually have an unproductive inside zone of severe shading. Solid hedgerows which are relatively tall (over 10 feet) usually have poor light distribution in the lower part of the canopy. The solution is twofold: 1) do not let the canopy be taller than 10 feet and 2) keep each tree in a cone shape with space between the upper parts of the canopy, allowing light to penetrate into the lower canopy.

An important factor which can help you achieve adequate light distribution in trees is the use of dwarfing rootstocks. Dwarfing rootstocks help in two ways: 1) smaller trees have better light distribution as no part of the canopy is far from full sun and 2) the chore of pruning to remove excessive limbs is easier as fewer limbs must be removed.

You should now appreciate that achieving high light interception may not be compatible with achieving good light distribution. If light interception is much greater than 70%, within-tree and between-tree shading can become excessive. If you have trees taller than 10 feet, you may increase light interception but, at the same time, light distribution in the lower part of the canopy will suffer. A successful orchard system has the right balance with approximately 70% light interception and at least 50% of full sunlight in all zones of the canopy.

PRUNING AND TRAINING

Being successful with any orchard system requires a thorough knowledge of a tree's response to various pruning and training techniques. This includes understanding the difference in tree response 1) to heading versus thinning cuts, 2) to pruning 1-year versus older wood, 3) to pruning in the winter versus in the growing season and 4) to changing limb angles. Growth can be stimulated with dormant heading cuts into one-year-old wood and by vertically orienting limbs. A less vigorous response occurs when pruning during the growing season, when pruning into older wood and when training limbs horizontally. As mentioned above, pruning is always a dwarfing process even though it may be locally invigorating. Not only is it important to be aware of the vegetative response but also the reproductive (fruiting) response to these practices.

Knowledge about light interception and distribution and pruning and training practices is the framework on which to build a successful orchard system. The sunlight factor and the pruning and training factor are interrelated. For example, excessive pruning of young trees reduces light interception (delaying cropping) and removing old limbs improves light distribution (improving fruit quality).

Armed with an understanding of the physiological responses to pruning and training and with an appreciation of the importance of sunlight (both interception and distribution), you will be successful with almost any orchard system. You will in fact, based on this knowledge, develop your own unique management system. You will almost certainly be successful if you choose a dwarfing and precocious rootstock, support the trees in some way, plant branched trees at 600 to 1,000 trees/acre and prune and train trees to keep the trees less than 6 feet wide and 10 feet tall. The system you develop won't have a name. It will be the "Smith" or "Jones" orchard system. It is not critical that you follow guidelines for the slender spindle, vertical axis, HYTEC, Tatura trellis, Güttingen V or any other system. What is critical is your basic understanding of pruning and training and your commitment to active sunlight management. With these basic concepts, you will be successful with any of the systems listed above or with your own system.

Success is unlikely with two orchard systems, the Lincoln canopy and Ebro trellis. Both of these systems have horizontal canopies. The pruning and training needed to force a tree into an unnatural horizontal plane is counterproductive—it stimulates excessive upright and lateral growth at the expense of cropping.

Select an orchard system, or develop one, that you can justify on the basis of its successful interception of sunlight, its thorough distribution of sunlight and its effective pruning and training practices. There is no "right" orchard system, just the challenge of finding a way to be successful. □

CANOPY MANAGEMENT FOR ORCHARD PRODUCTIVITY:
The Importance of Sunlight Captured by Spurs versus Shoots

Alan N. Lakso, Jens Wünsche, and Terence Robinson
Department of Horticultural Sciences, New York State Agricultural Experiment Station, Cornell University, Geneva, NY (second author is from the University of Bonn, Germany)

(from New York Fruit Quarterly, 1994)

Considerable research has gone into identifying the reasons why the yields in apple systems vary so much. Tree density, percent ground cover, and canopy volume or tree surface area have been used, but these are only useful for specific tree shapes or with certain types of canopy management. A much more sound principle found is that the potential productivity of an orchard is limited by the total amount of sunlight captured by the orchard. Of course, actual productivity may be limited further by stresses, frosts, or excessively dense tree canopies. The decline of yields in older trees that have become too dense is a common occurrence that demonstrates that potential yields are not always reached in the orchard. This research was aimed at determining some of the reasons why potential yields are not attained more often and how pruning and training can be best targeted to improve yield, fruit quality and packout.

Earlier physiological studies in Europe and in our labs have shown that spur leaves provide the primary support for fruit development for good size potential and set in the first month after bloom while shoot leaves on growing extension shoots primarily support shoot growth. Therefore, we feel that the most productive orchards are those that capture the most sunlight with spur leaves early in the season, especially at about three to four weeks after bloom when final set is being determined. Thus, assuming healthy trees, our idea can be stated as:

> "Apple orchard productivity is controlled primarily by the total sunlight capture by the spur leaves, especially at about one month after bloom."

To help figure out which leaves were actually intercepting the sun, a new technique had to be developed. A laser beam mounted on a pole that moves over the trees as an artificial sun lets us estimate spur versus shoot light capture for the first time by observing which leaves are hit by our laser "sunbeam." This technique, along with other measurements, was used to compare at different times during the season the total sunlight capture by different leaf types with several different training systems and different varieties.

RESULTS

Work was begun in 1991 to test this idea in a 14-year-old, four-system 'Empire' comparison trial at the Experimental Station that has shown not only differences in yields and light interception, but also different efficiencies of converting captured sunlight into fruit. A Y-trellis/M.26 was more efficient at converting captured sunlight into fruit compared to Slender Spindle/M.9, Interstem Central Leaders on M.9/MM.111, or Central Leaders/M.7. The major results were that yields were related to the amount of total sunlight captured per acre. But when we analyzed which leaves captured the sunlight, we found that yields were closely related to the sunlight captured by the spurs but poorly related to sunlight capture by the extension shoots. Although supportive of our idea, these established systems had canopies that were maintained to be very open and had a high percentage of exposed spurs, so they did not provide a good test of this idea in orchards with denser canopies that are more problematic for the grower.

So, in 1992, two planting systems representing differing cultivars and ages were selected to further test the idea. The first system was a mature McIntosh/M.9 planting at the Red Jacket Orchards in Geneva, while the second was a vigorous four-year-old Jonagold/M.9 spindle planting at the Experiment Station. These systems were chosen to give systems that were different from the very open, spurry Empire systems used earlier. In each planting trees were dormant pruned to cause more open versus more dense canopies that had differences in sunlight captured by spurs versus shoots.

We compared the yields of all these systems versus sunlight capture patterns in 1992. Similar to the results in 1991 at about one month after bloom, yields were positively related to the light intercepted by the spurs but negatively related to light capture by extension shoots. At full canopy in July, the same relationships still held, but they were not as good as earlier. Again, these results are supportive of the idea proposed that yields seemed to be better related to sunlight capture by the spurs than to sunlight capture by the extension shoots. This suggests that the early period just before fruit set is the critical time to get sunlight to spurs.

IMPORTANCE TO PRUNING AND TRAINING

The results we found in these studies stress the importance of several points about pruning and training that are known to be helpful for productivity of apple orchard systems:

1. Open canopies, regardless of form, are needed to be able to get sunlight to the spurs inside the canopy. It appears that the critical timing to have open canopies for good yields is early in the season, at about 3-4 weeks after bloom.

2. Good dormant pruning is needed to assure that early season exposure of the spurs; summer pruning is too late to correct a long-standing problem of excessive canopy density, although it can help improve final fruit color.
3. Spreading or tying down branches can open up the canopy for light to penetrate to the spurs as well as reduce the number of vigorous competing shoots.
4. Continuously open canopies lead to strong, vigorous spurs with good leaf area. This is important to make the spurs as productive as possible when the sunlight reaches them. Long periods of shade are very harmful to spur quality.
5. Fruit quality differences appear to respond primarily, but not exclusively, to the current season conditions, but yield differences are a multiple season effect. So, good pruning and training practices need to be done each year.

We would like to thank the New York Apple Research and Development Program and the Daimler-Benz Foundation of Germany for partial support of this research, Steve Denning for outstanding technical support, and Joe Nicholson of Red Jacket Orchards, Geneva, for use of his orchards for this study. Also we would like to acknowledge the foresight of the New York Apple Research Association for supporting earlier physiological research that provided the basis of this work. □

MATCHING ROOTSTOCK AND TREE SPACING

Terence L. Robinson
Department of Horticultural Sciences, New York State Agricultural Experiment Station,
Cornell University, Geneva, NY 14456

(from 1995 Fruit Tree Catalog and Grower Reference Guide, Adams County Nursery)

When growers plant a new orchard the decisions of rootstock and tree spacing to a great extent determine the performance of the orchard for the next 20 years. If rootstock and tree spacing are mismatched. either growers must prune excessively to hold the trees to their allotted space or the trees never fill their allotted space. In either case, yields are low and economic returns are disappointing. Over the years, growers have generally been cautious not to plant trees too close together so that if excessive tree vigor later developed the trees would have room to grow. With the recent trend toward higher tree densities and more dwarfing rootstocks, growers need to understand the economic costs of spacing trees too far apart and rethink appropriate tree spacings.

Research plots have shown that tree density is the single most important factor affecting yields in the first 5-7 years. Thus, the best way to obtain high early yields is to plant high tree densities. The specific tree training recipe used in the early years has been shown to be less important than the tree density as long as minimal pruning is employed; however, if a vigorous rootstock is used in a high density orchard then as the orchard matures, management often becomes problematic. Conversely dwarf rootstocks have the major advantage of limiting mature tree size thus giving easier management at maturity while inducing early cropping.

The use of dwarfing rootstocks has in most cases resulted in improved early yields and fruit quality but in some cases growers have been disappointed with relatively low mature yields. This is because trees in dwarf orchards are often planted too far apart, resulting in poorer lifetime returns than with a lower density semi-dwarf orchard. Often the justification for relatively wide in-row spacings is the desire to walk around the tree at maturity while the justification for wide between-row spacings is the desire to use existing equipment. Both of these reasons are costly and should not be used in planning the new orchard if dwarfing rootstocks are to be used. If in-row and between-row spacings are too wide, then the small mature canopy volume of dwarf stocks will limit the amount of light energy the canopy can intercept and consequently the yields per acre will be low. For example, if a grower chooses to plant trees on M.9 and aims for a mature tree height of 6 ft. yet chooses a row spacing based on existing orchard equipment which was designed for 12 ft. tall central leader trees, light interception at maturity will be only 40-45% of the total available light and yields will be 500-600 bushels per acre. This level of mature yield could be surpassed by a well-spaced semi-dwarf central leader orchard. High yields per acre with dwarfing rootstocks require high total light interception when the orchard is mature. For optimum yield performance, mature orchards should aim to intercept around 60-70% of the available light falling on an acre. To obtain this level of light interception, the orchard canopy must cover a large portion of the land.

Mature orchard light interception is a function of tree height to tractor alley width ratio. If mature tree height is reduced (as is the case with dwarf rootstocks) without a compensatory reduction in tractor alley width (as is the case when rows are spaced wide for existing equipment), then mature light interception and yield will be reduced. Over the years, 3 formulas have been developed for determining optimum row spacing and tree height to optimize light interception. The first is from Dr. John Cain, formerly of Cornell University, who proposed that:

(1) Optimum Tree Height = Clear Alleyway x 2.

The clear alleyway is the distance between the ends of the scaffold branches of trees in adjacent rows. In this formula, the clear alley is not the same as the row spacing, but in most cases is close to the width of the equipment.

The second formula was developed by the late Dr. Winter from Germany who proposed that:

(2) Optimum Tree Height = (Between Row Spacing ÷ 2) + 3 ft.

With his formula, growers can calculate either the best tree height for their chosen row spacing or the optimum row spacing, given a desired tree height.

A third formula has been proposed by our program in New York:

(3) Optimum Tree Height = Between-row Spacing x 0.75 .

Using either of these formulas to analyze existing dwarf orchards shows that with many either the tractor alleys are too wide or the trees are too short for optimum light interception. This is most often a problem with pedestrian orchards where mature tree height is only 6 ft. In this case between-row spacing should be only 8 ft. (using formula 3). Since this clearly is not possible with conventional machinery, an alternative would be to increase the height of the trees relative to the clear alley width or change the shape of the tree into a V shape to more fully utilize available light. However, what often happens is that growers reduce tree stature by the use of dwarf rootstocks but end up wasting a high percentage of the acre in wide tractor alleyways, thus wasting most of the light energy falling on the acre.

The take-home message from these principles is that with M.9 or B.9 orchards, whether trained as Slender Spindle, Vertical Trellis or HYTEC, the trees should be at least 8-9 ft. tall when row spacing is 10-12 ft. wide. With slightly more vigorous stocks such as O.3, M.26, or Interstems, trees should be 10-12 ft. tall when using wider row spacings of 13-15 ft. The Vertical Axis training system is an excellent choice for this row spacing and tree height. Although this will still necessitate ladders for harvest, yields and light interception will be substantially higher than the shorter trees.

In making the choice of rootstock and tree spacing, it should be remembered that high tree density is the most important factor influencing early yields and that the particular orchard system chosen is less important as long as minimal pruning is used. Growers can be successful with many different high density systems if they choose the proper tree spacing and tree height that will give high light interception and then use minimal pruning. □

IDFTA Calendar

February 25-29, 1996
39th Annual Conference ▪ Penticton, British Columbia, Canada

June 23-25, 1996
Summer Tour ▪ Michigan

February 23-26, 1997
40th Annual Conference ▪ Rochester, NY

October 1997
Japan Tree Fruit Study Tour and International Fuji Conference ▪ Nagano, Japan

BAGS GIVE MORE THAN JUST BRANCHES

Phil Schwalier, District Horticultural Agent and Coordinator of the Michigan State University Clarksville Horticultural Experiment Station

(from Fruit Notes 4:4-6, March 22, 1995; Cornell Cooperative Extension, NY)

Placing a polyethylene bag over dormant leaders and newly planted whips does promote branching. This technique promotes flowers and fruits as well. During 1993 apple growers applied polyethylene bags to numerous newly planted trees and older leaders on two- and three-year-old trees to promote branching. On the newly planted trees, branching increased on some varieties. It appears that trees that branch easily are not always improved by the bagging technique. For example, leaders that were bagged on Gala had 17.0 shoots per tree and those that were not bagged had 17.1 shoots per tree. Table 1 lists varieties and the results of a bagging trial at Clarksville Horticultural Experiment Station and also in the west-central Michigan fruit area.

The bagging technique was introduced to us at the 1991 horticultural show by Dr. Dan Strydom from South Africa. A long, narrow bag is placed over the leader three weeks before anticipated bud break and then removed when the shoots inside the bag show approximately 1/2" to 1" green tissue. At that time, buds outside the bag will typically just be at the green tip stage. The greenhouse effect of the bag promotes bud break and shoot development inside the bag. Also, it is important to not remove the bags during extreme weather conditions such as heavy winds or extremely hot temperatures. The tender tissue that is exposed after the bag is removed needs a day or two to acclimate to normal weather conditions. A thunderstorm or windstorm can damage the tender tissue when it is exposed.

Preliminary results from counts done on trees that were bagged in 1993 are encouraging. Empire and Northern Spy responded quite favorably to the bag treatment by producing more shoots. These varieties are noted for being difficult to branch.

At Triple H Farms in Belding, Michigan, additional data were collected on three-year-old Empire trees. With Empire in the spring of 1994, flower cluster numbers and preliminary fruit set were determined. Bagged Empire had 6.4 shoots per tree while nonbagged Empire had 3.5 shoots per tree, an 83% increase in branch number. There was a 121% increase in the number of flowers on the tops of Empire trees that were bagged compared with unbagged trees. These trees had their leaders bagged in the spring of 1993 to promote branching. It appears that bagging promotes shoot numbers and the shoots grow flowers that set fruit. The number of flower clusters per tree on bagged trees was 88.4 versus 39.5 for nonbagged Empire. A preliminary count of fruit set on June 17, 1994, indicated a similar increase in fruit numbers on these Empire tree tops. In the same area, bagged Empire leaders produced 19.5 fruits per tree versus nonbagged leaders that produced 8.5 fruits per tree. That is similar to the increase of 120% we saw with flower numbers. The fruit set count data were done before June drop so there may be some changes in those fruit numbers. The important data will be harvest yields on bagged versus nonbagged trees. Our observations indicate that we will see the same relative differences when we get to harvest. A preliminary count on Jonagold indicated the same relationship with an increase in flower cluster numbers (Table 2) and also a corresponding increase in fruit numbers.

It appears that bagging leaders and trees will promote branches on some varieties. Those varieties that are difficult to branch tend to respond well to this treatment. Varieties that branch easily tend to respond poorly to the bagging treatment, at least to promoting branch numbers. With more branches on these bagged trees, we see more flowers and, with more flowers, more fruits set. Our preliminary data indicate that an increase in fruit follows a similar increase in shoot number. Although this is our first year of truly testing shoot bagging, it appears that yields on bagged trees will be higher than that on nonbagged trees. □

R · E · C · I · P · E

SUGAR-FREE APPLESAUCE

2 lbs. cooking apples
1-1/4 cups apple juice
1/3 tsp. ground cloves
the rind of 1/2 orange, finely pared

Wash apples and cut away any bruised or discolored pieces. Cut fruit into large pieces and place into large pan along with apple juice, cloves and orange rind. Bring to a boil and simmer until most of the liquid has evaporated and the fruit has softened. Cool thoroughly.

Place cooked apples in sieve and press through using the back of a wooden spoon. Applesauce can be stored in refrigerator or freezer until ready to use.

For variety, use cinnamon instead of cloves, or cherries instead of orange rind. Use your imagination and create your own unique flavors!

Table 1
Number of shoots produced per tree from bagging leaders in 1993

Variety	No bag	Bag	% increase
Empire	4.4	6.9	56
Gala	17.2	17.0	-1
Golden Delicious	12.0	17.0	42
Jonagold	14.0	17.7	26
Crispin	9.4	12.2	30
Rome	11.8	13.4	14
Northern Spy	3.4	6.6	94
Average	10.3	13.0	26

Table 2
Flower clusters and fruit produced from bagging leaders trial in 1993

Variety	No bag	Bag	% increase
		No. of flower clusters/tree	
Empire	39.9	88.4	121
Jonagold	35.1	37.9	8
		No of fruit/tree	
Empire	8.5	19.5	129
Jonagold	7.0	9.7	38
		Harvest count of fruit/tree	
Empire	10.8	18.5	71
Jonagold	5.4	9.3	72
		Yield/607 trees	
Empire	131	241	84
		Cost to bag/tree	
Bag cost			.03
Labor			.20
Total			.23

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COMPACT NEWS

A Periodic Newsletter of the International Dwarf Fruit Tree Association

No. 4 September 1995

THE BRITISH COLUMBIA FRUIT INDUSTRY

Mike Sanders, P. Ag.
Tree Fruit Specialist

You are invited to attend the IDFTA conference in Penticton and to see firsthand modern innovations in our high density orchards.

The British Columbia fruit industry is centered in the scenic Okanagan Valley. This area is Canada's largest producer of apples for the fresh market. In addition to apples, commercial crops of pears, sweet cherries, peaches, apricots, plums and prunes are also produced.

The British Columbia fruit industry is going through some exciting times. Many growers have planted high density apple systems such as vertical axis, slender spindle and super spindle. New varieties such as Gala, Fuji and Braeburn have been widely planted and innovative techniques such as fertigation are common throughout the area.

Although apples are the dominant crop, new technology is being utilized on all crops, especially sweet cherries, where some high density trial plantings have been made.

In addition to its vibrant fruit industry, the Okanagan Valley also has excellent downhill and cross-country skiing. Spend some extra days before or after the conference to enjoy some of the finest ski conditions anywhere.

FEATURED SPEAKERS

At the 39th annual IDFTA conference in Penticton, British Columbia, the program will feature outstanding international speakers. In their presentations they will emphasize training systems and dwarfing rootstocks for apple and cherry. Today, with the commercial planting of dwarf sweet cherry orchards in Europe, a revolution in cherry orchard management is taking place. This is not unlike the change to high density systems which took place with apple in Europe over 30 years ago. To further emphasize the new opportunities with cherry, Dr. Jim Flore of Michigan State University will present the Robert F. Carlson distinguished lecture on "Cherry Tree Physiology and Management."

Jean-Marie Lespinasse from Bordeaux, France, is recognized around the world for his innovation and expertise in apple tree training. In 1962 he joined INRA (National Agricultural Research Institute) at the Bordeaux research center. His study of fruit quality in relation to position in the tree gave rise to a new concept in apple tree training-the vertical axis (also termed the French axe). In 1977 he published (titles translated from French to English) "Apple Tree Management, Classification of Fruiting Habit, Influence of Tree Training," and in 1980 "Apple Tree Management II, The Vertical Axis, The Renovation of Orchards." These are among the most significant papers recently published in pomology. In these articles, he classified apple varieties by fruiting and growth habit from spur types (Type 1) to tip bearers (Type 4) and emphasized the different pruning and training techniques required for each type. He developed the Solen tree training system for tip-bearing varieties. He and his colleagues are currently studying apple tree architecture and the inheritance of branching and fruiting habit in apple breeding populations. He will make two presentations in Penticton: ➤

"Orchard Management Techniques in France" and "Influence of Fruiting Habit on Pruning and Training of Apple Trees."

Dr. Hiroo Koike from Nagano, Japan, is an authority on high density orchard management of Fuji apples. He received his education at Tokyo Noko University and in 1967 began research on fruit tree culture at the Nagano Fruit Tree Experiment Station. He has since 1993 been head of pomology at the experiment station. He has also been an extension specialist and currently is a part-time lecturer at Tokyo Noko University. His research emphasis has been on dwarfing rootstocks, tree density and tree training with Japanese apple varieties including Fuji and Tsugaru. He has also studied sunlight and fruit distribution in tree canopies, crop load, fruit thinning, alternate bearing, fruit color enhancement and fruit bagging. Dr. Koike has written or co-authored several books in Japanese, including (titles translated to English) Apples, Dwarf Apple Culture, Training and Pruning Deciduous Fruit Trees, Pomology, and Rootstocks for Tree Fruits. He has also written a book on fruit growing for children. He will give two presentations at the IDFTA conference: "Latest Developments in Apple Production and Management in Japan" and "Challenges with Fuji Apples."

Dr. Sabine Franken-Bembenek from Giessen, Germany, is a world authority on dwarfing rootstocks for cherries. She received a doctoral degree in 1979 from the Institute for Genetics and Plant Breeding at Hanover University. At the Institute of Pomology at Giessen University, she has been a member of the cherry rootstock breeding team with Professor Gruppe. At Giessen University she has taught courses in pomology, plant breeding and vegetable production. Recently her responsibility has been the evaluation and summary of European data on the Giessen and other dwarfing cherry rootstocks. One of the dwarfing Giessen rootstocks has been released in Europe as Gisela 5 (Giessen 148-2). Dr. Franken-Bembenek will make two presentations at this year's IDFTA conference: "Giessen Cherry Rootstocks" and "Production of Sweet Cherries in Germany." ❐

TREE RESPONSE IN BRITISH COLUMBIA TO FIRST YEAR TREATMENTS

Mike Sanders, Horticulturist
British Columbia Ministry of Agriculture, Fisheries and Food ▪ Kelowna, B.C., Canada
(from *The Tree Fruit Leader* 4(1):2-3, March 1995)

In 1989 I planted a plot at the Test Orchard to determine the optimum treatment for whips in the year of planting. McIntosh on Malling 9 was used. The treatments consisted of various heading cuts to the leader (32" at planting, 32" when new shoots are about 1" long, 20" at planting, and 10" at planting), girdling, unheaded and low quality two-year-old branched trees. The unheaded treatment was trained and managed, more or less, as super spindle trees. The other treatments were managed as slender spindle trees.

The highest per-tree yield after six years was obtained from the two-year-old branched tree, but this was not significantly different from the 32" headed at planting, or 32" delayed headed treatments or the trees that were not headed. Yield on these four treatments was considerably higher than the other treatments.

However, some significant growth differences occurred. The headed treatments and the two-year-old branched trees all covered approximately 50% more ground area than the unheaded treatment whereas the unheaded trees were in the range of 15% taller than the other treatments.

Overall tree vigor on the headed tree was much higher than in the unheaded trees. The unheaded trees did throw a few strong shoots but were much easier trees to work with regarding training and pruning.

After being told for so many years that heading whips in the year of planting is necessary, it is interesting to note the results from unheaded whips. The only system that has not regularly headed whips is super spindle type plantings; however, some vertical axe plantings have also not used heading cuts.

Results from unheaded whips in this trial show that this technique may result in some real benefits. Higher densities can be planted (1,400 to 2,000 trees per acre without using intensive super spindle techniques), yields will be higher and the trees are easier to manage. Longevity of such plantings is unknown. The key is to increase the distance between the rows for unheaded trees because they are taller but to reduce the spacing in the row because they are narrower. Try some. You might be surprised.

At the 1995 International Dwarf Fruit Tree Association (IDFTA) meeting held in Pennsylvania, February 26 to March 1, super spindle densities were discussed by horticulturists from the Bodensee area of southern Germany and South Tyrol in Italy. Lifespan of the first super spindle planting was too short, so densities have declined to around 1,500-2,000 trees per acre for recent plantings. Their thought is that if trees cost more than $3.00 each, super spindle will not be economic. The South Tyrol advisory service did a survey of commercial orchards and found the most profitable densities were from 1,200-2,000 trees per acre. ❐

IDFTA CALENDAR

February 25-29, 1996	39th Annual IDFTA Conference, Penticton, British Columbia, Canada
June 23-25, 1996	IDFTA Summer Tour, Michigan
February 23-26, 1997	40th Annual IDFTA Conference, Rochester, New York
October 28 - November 12, 1997	Japan Tree Fruit Study Tour and International Fuji Conference, Nagano, Japan

TRAINING SYSTEMS FOR HIGH DENSITY APPLE PLANTINGS IN BRITISH COLUMBIA

Mike Sanders, Horticulturist
British Columbia Ministry of Agriculture, Fisheries and Food ▪ Kelowna, B.C., Canada
(from *Steps to Success in Replanting*. 1994. Okanagan Valley Tree Fruit Authority)

There are a number of training systems for high density apple plantings. At the present time, the slender spindle, vertical axis, and perhaps super spindle seem the best bets for the Southern Interior of B.C.

Local research has shown higher production from slender spindle and vertical axis than from freestanding central leader or van Roechoudt vertical trellis. Well-documented local results, however, are not available for super spindle, but those from two-year-old trees seem promising. The key to profitability will be sustained production and high returns; the system may work, but it must be profitable. Short descriptions of the three main systems, slender spindle, vertical axis and super spindle, are presented. A table is included which compares the systems.

SLENDER SPINDLE

Slender spindle trees are planted at between 700 and 1200 trees/acre. They are supported by posts and grown to a height of 6 to 8 feet. The posts are necessary for tree support because of poorly anchored rootstocks and for tree training.

This system uses zigzagging or bending of the leader to help control the vigor at the top of the tree. The post is also used as a place to tie the leader. Vigor of the branches is controlled by tying them down.

The key to success with this system is early production, which helps suppress tree vigor. Start with high quality, well-feathered nursery trees for success with this system. Use of poor quality trees limits economic viability and therefore paying a little extra for strong, well-feathered trees is a good investment.

Very little pruning is needed on slender spindle trees in the early years. Pruning stimulates growth which delays fruiting. Strong branches in slender spindle trees are removed and remaining branches are bent, a measure that reduces vegetative vigor and encourages fruit buds to develop. Pruning to the annual ring of wood two years old and older helps to stiffen branches, shape trees, and provide renewed fruiting wood. In the third or fourth year when shading begins, it is time to start to remove branches selectively.

Once the space is filled, the spread of the trees is contained by cutting back to older wood. In a similar fashion, trees are maintained in a conical shape by cutting back to older wood and by removing and renewing vigorous wood.

VERTICAL AXIS

Vertical axis trees are 10 feet tall at maturity and are planted at 600 to 800 trees/acre. This system uses a trellis support with several alternative arrangements. For dwarfing rootstocks, five equally spaced horizontal wires support the tree and are themselves attached to posts at the end of each row. An alternative is to use 2 horizontal wires plus a vertical wooden or bamboo stake for each tree; the stake is attached to the wires.

The main disadvantage of vertical axis is the height of the trees which means ladders are required. On the other hand, to encourage early production, very little pruning is done in the early years. At planting, whips are headed whereas feathered trees are not. In both cases, the leader is never headed after the planting year, although at times it may be removed by making a thinning cut to a replacement leader. The lack of heading cuts to the leader encourages fruiting which helps control the tree's vigor and height.

Because leaders are not headed, however, the leaders are weak and must be tied to the wire or the support post to prevent breaking. The lack of heading also often results in sparse branching which can be compensated for by pinching off the tips of the 3 or 4 lateral shoots immediately below the terminal shoot.

The first pinching is done when the new shoots are 2 to 4 inches long and it may need to be repeated once or twice more at about 2-week intervals. This is done annually to the top of the tree for 2 to 3 years to encourage development of flat-angled branches on the leader.

If the pinching is done properly, little pruning will be needed in the early years. During the dormant period, the removal of the odd strong branch, low branches, and the shoots that were pinched (since they tend to be sharp-angled) is all that will be needed. When branches are 2 to

3 years old, they will need to be cut back to the annual ring, fruit buds, or weak shoots to keep fruiting close to the leader.

In the third or fourth year, shading will develop and some branches will need to be thinned out to promote good distribution of light. The lowest layer of branches should be thinned out first. Over 1 to 3 years, depending on the number of branches, remove all but 4 or 5 of these lower branches. The remaining branches will be left permanently. Branch removal should not be started unless the branches in the layer immediately above are expected to crop the following season. This helps prevent the leader from becoming too vigorous.

Thinning of the other layers of branches is done in the same way. Except for the 4 or 5 permanent basal branches, all others are considered temporary and branch renewal is carried out on them.

As with the slender spindle, vertical axis trees are contained within their space by cutting back to older wood. The conical shape is maintained down the row by cutting back to older wood and by removing and renewing vigorous wood. In the row, however, shape is not important; this allows a fruiting wall with maximum bearing surface to develop.

Patience must be exercised with the top of vertical axis trees. If the tops are pruned too soon, they will become dominant, forming an umbrella. The object is to wait until fruiting brings vigor at the top under control before you prune. This is usually when the trees are 4 to 6 years old.

At this stage, trees may be as much as 4 to 5 feet above the top wire. A thinning cut in the vicinity of the top wire to a 2 to 3-year-old shoot bearing fruit buds is usually sufficient to keep top vigor under control.

SUPER SPINDLE

Super spindle is a relatively new development in high density apple production. It uses extremely high numbers of trees per unit area to increase early production level.

Trees in a super spindle system are planted at 2000 to 5000/acre. The system requires strong support of wire and posts or bamboo stakes and is expensive to establish. It is not a system for those unfamiliar with it or unprepared to take the time necessary to establish and maintain it. Experience with this system in the B.C. fruit districts is limited; the oldest commercial trees were 4 years old in 1995.

While increasing density increases early production, it has not been determined if the growth can be controlled well enough to prevent self-shading and poor quality fruit. This is the greatest risk with super spindle and could lead to a short life for the orchards. The cost of controlling growth is another factor to consider.

Control of vigor by heavy fruiting is the key to success with super spindle. No dormant pruning is done and pruning during the growing season is a matter of removing vigorous branches and shoots by breaking or tearing them off. Growth regulators such as ethephon (ethrel) and NAA are also used to keep vigor in check. ❐

Table 1. Comparison of training systems.

	Vertical axis	Slender spindle	Super spindle*
Planting densities	550-900 t/ac	700-1500 t/ac	2000-5000 t/ac
Row spacing	12′ - 13′	10′ - 12′	9′ - 10′
In-row spacing	4′ - 6′	3′ - 5′	1′ - 2′
Tree height	10′	6′ - 8′	6′ - 8′
Rootstocks	dwarfing	dwarfing	dwarfing
Tree form	fruiting wall	single tree	fruiting wall
Support	trellis	post	trellis
Nursery stock	feathered preferred		whip with short shoots
Costs to establish	lowest	middle-low	highest
Early production	similar		highest
Production at maturity	should be similar for all systems if good space is chosen		
Total production	similar		highest
Fruit quality	highest	high-middle	lowest
Labor required	lowest	middle	middle to highest
Skill required	lowest	middle	highest
Planting life	similar		shortest

**Since super spindle is a new system, there is some guesswork in the comparisons.*

IMPROVE RETURNS BY IMPROVING GRADES

Mike Sanders, P. Ag., Tree Fruit Specialist, BCMAFF, Kelowna, B.C.
(from *The Tree Fruit Leader* 3(2):1-3, July 1994)

Overproduction has thrown the world apple market into a competitive and volatile arena. Unless every grower recognizes the need for improved grades, sizes and yields, he will never maximize his returns. The impact of grade and size on returns is often underestimated. A quick analysis of packinghouse returns is all that is needed to observe the large price differences between grades and sizes. Bruising, lack of color, and small size are the main reasons for downgrading. However, even blemishes, poor shape, russet, and sunburn can harm the value of your crop.

The following tables list reasons for downgrading, the causes, and some viable solutions. Take the time to study your packouts to determine the reasons for downgrading, and take steps to improve grades and returns. The greatest impact on grades in many orchards will result from improved pruning and nitrogen management. ❐

Table 1. Improve returns by improving grades.

Reason for grade loss	Main causes	Solution
Poor color (Color picking several times usually results in higher packouts)	▪ excessive vigor, too much nitrogen or water	▪ Reduce or eliminate N; don't over-prune; improve irrigation scheduling
	▪ shading	▪ Improve light conditions by improved dormant pruning ▪ Summer prune in August; don't overdo; remove upright shoots and suckers interfering with light penetration
	▪ old, weak fruit spurs	▪ Thin out and/or remove old spurs
	▪ old trees and strains	▪ Plant new varieties and strains
	▪ warm temperatures prior to harvest	▪ Misting or overhead watering may help
Small size	▪ low vigor	▪ Treat for nutrient and pH problems as per leaf and soil analysis
	▪ inadequate thinning (too many apples)	▪ Blossom thin ▪ Hormone thin ▪ Hand thin by size and quality
	▪ cool weather following blossom	▪ Heavier thinning
	▪ poor pollination	▪ Plant more pollinizers or use pollen inserts or bouquets ▪ Use bees
	▪ shading	▪ Improve light conditions by pruning
	▪ old, weak fruit spurs	▪ Thin out and/or remove old spurs
Bruising (occurs when picking, hauling and packing)	▪ poor harvesting and handling practices	▪ Pick at proper maturity and handle fruit carefully at all times; thoroughly instruct pickers about proper harvesting practices; supervise carefully; smooth out orchard roadways and drive smoothly
	▪ low fruit calcium	▪ Apply calcium sprays

Reason for grade loss	Main causes	Solution
Bruising (occurs when picking, hauling and packing) *(continued)*	▪ excessive vigor	▪ Reduce or eliminate nitrogen; don't overprune
	▪ excessive water	▪ Improve irrigation scheduling
Blemishes	▪ pests, diseases	▪ Use a suitable spray program ▪ Remove damaged fruit when hand thinning
	▪ limb rubbing	▪ Remove upright fruiting wood and remove narrow crotches
	▪ disorders (i.e., bitter pit)	▪ Remove damaged fruit when hand thinning ▪ Maintain desirable tree vigor ▪ Avoid heading cuts when pruning ▪ Apply calcium sprays ▪ Summer prune in August but do not overdo ▪ Remove upright shoots and suckers that are interfering with light penetration
Poor Shape (Promalin improves shape and typiness of Red Delicious)	▪ poor pollination	▪ Ensure adequate pollinizers or use pollen inserts or bouquets ▪ Use bees
	▪ boron deficiency	▪ Maintain boron levels ▪ Remove undesirable fruit when hand thinning
Russet	▪ cold weather (i.e., frost ring)	▪ Avoid planting in cold pockets
	▪ sprayer injury (too much wind velocity)	▪ Reduce wind velocity, especially in narrow plantings
	▪ spray injury	▪ Do not apply under slow drying or hot conditions; check compatibility
	▪ powdery mildew	▪ Use a suitable spray program
Sunburn	▪ low vigor; not enough leaf cover	▪ Increase vigor to desirable level by following results from leaf analysis
	▪ over-cropping	▪ Improve fruit thinning
	▪ excessive summer pruning	▪ Use moderate level of summer pruning
	▪ early summer pruning	▪ Delay summer pruning until August
	▪ shifting limbs	▪ Stiffen limbs by gradually pruning back to older wood; tie or prop limbs but, if doing during the season, do it early so as not to change position of limb
	▪ exposed bins at harvest	▪ Place bins in shade
	▪ drought	▪ Maintain desirable level of soil moisture.

IDFTA CONFERENCE IN BRITISH COLUMBIA

This issue of Compact News features the British Columbia tree fruit industry and the keynote speakers at the February 25-29, 1996, IDFTA conference in Penticton, B.C. As a setting for the IDFTA conference, the Okanagan Valley in B.C. is ideal. Nowhere in North America has the change to high density orchard management taken place more quickly or extensively than in B.C. Innovations in B.C. orchards include super spindle apple tree training, intensive sweet cherry plantings and bagging of Fuji fruit. We hope you will be able to attend the IDFTA conference in Penticton. Conference registration and lodging materials and the full program will be sent to IDFTA members in December.

Bruce H. Barritt
Education Director

International Dwarf Fruit Tree Association

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