

Department of  
Horticulture

MICHIGAN  
STATE  
UNIVERSITY

# COMPACT FRUIT TREE

DWARF FRUIT TREE ASSOCIATION

Vol. 3, No. 5, June 1969

Rootstock Behavior

Spur Types

Induced Dwarfing

Cultural Practices

Edited by R. F. Carlson

## SUMMER TOUR OF SOUTHERN ONTARIO - DFTA - JUNE 26 - 27, 1969

The Dwarf Fruit Tree Association has scheduled southern Ontario for its annual summer orchard tour. Tree fruit research by Canada and Ontario Departments of Agriculture will be featured at the Harrow Research Station and the Simcoe Horticultural Experiment Station in association with complex grower operations in each of the respective regions. Emphasis will be on peach, apple, pear and apricot crops. This program is open to all interested American and Canadian fruit growers. Information is the object, in this case with an international flavor. Sources will be leading fruit growers, scientists and extension specialists.

### PROGRAM

#### June 26th

- 8:30 a.m. - Registration at Leamington Fair Grounds, Hwy # 77  
(See Essex Tour Map).  
Pick up name tags and tickets:  
    Buffet-Round Table Discussion (London) - \$5.00  
    Bus Tours - Essex County - \$1.50  
                    - Norfolk County - \$1.50  
As buses are loaded, groups will be dispatched under direction of tour guide.
- 9:30 to 12:00 a.m. - Tree fruit research at the Canada Agriculture Harrow Research Station:  
    -Winterhardy peach breeding for improved scion and rootstock varieties - G. M. Weaver  
    -Canker control studies on peach - B. N. Dhanvantari  
    -Orchard soil management and weed control - W. J. Saidak  
    -High density plantings and training systems for peach - G. M. Weaver  
    -Fireblight resistant pears and winterhardy apricots - R. E. C. Layne  
    -Southwest injury and its control - R. E. C. Layne
- 12:15 to 1:30 p.m. - Box lunch on grounds of Harrow Research Station  
    -Welcome by Dr. L. W. Koch, Director; introduction of scientists followed by open question period.
- 2:00 to 3:30 p.m. - George Whaley Farm, Ruthven  
    -A large combined grower, shipper, nursery operation which will feature extensive plantings of apple with various scion/rootstock combinations but based almost entirely on size-controlling stocks; CA storage and a modern packing plant shipping under the Imperial Brand label; and fruit tree nursery.



## JUNE 26th

- 4:00 p.m. - Reassembly at Fair Grounds and depart for London.
- 7:30 p.m. - Buffet followed by informal growers' round table at Holiday Inn, Wellington Road, London, in the Great Hall. Excellent cuisine in pleasant surroundings.
  - Greetings on behalf of Dwarf Fruit Tree Association - *John Bell, Jr.*, President
  - The Fruit Industry of Ontario - *Dr. J. A. Archibald*, Director, Horticultural Research Institute of Ontario
  - Ontario's Apple Commission - *Jerry Long* - Chairman
  - Open discussion period

## June 27th

- 9:30 a.m. - Assemble at Simcoe Horticultural Experiment Station, Simcoe Hwy #3 (See Norfolk Tour Map)  
This is an affiliate of the Horticultural Research Institute of Vineland under the direction of *Dr. George Collins*.
- 10:00 to 12:00 a.m. - Simcoe Horticultural Experiment Station:
  - Apple rootstock and scion variety research - *A. Hutchinson*
  - Peach breeding, variety and rootstock research - *O.A. Brad*
  - Pear, sweet cherry and plum variety trials - *G. Tehrani*
- 12 - 1 p.m. - Box Lunch, Sincoe Station
- 1:30 to 3:30 p.m. - Norfolk Farms Ltd.
  - A 1200 acre complex fruit and vegetable operation; CA storage, packing and shipping facilities.
  - Wm. Kendall Orchards
    - Young apple planting on MM 106 and 111, McIntosh, Spy and Delicious varieties.

Note: Because of the anticipated large numbers attending, it will be impossible to accommodate private cars during the day tours and to maintain this schedule. We urge you to take advantage of the bus transportation and the knowledgeable tour guides.

## ACCOMMODATIONS

June 25th: For those arriving from the U.S. and distant Canadian points we recommend a number of excellent motor hotels in Windsor, Ontario.

- Holiday Inn, Riverside Drive, Windsor
- Seaway Inn, Ouellette Avenue, Windsor
- Sheraton-Viscount, Ouellette Avenue, Windsor

June 26th: Our stop-over will be in London for the evening buffet and grower round-table.

- Holiday Inn, Wellington Road, London
- Holiday Inn, Downtown London

## CAMPERS

Excellent public camping facilities are available for those travelling with families by tent or travel trailers.

Essex - Point Pelee National Park directly south of Leamington is most central for the Essex leg of the tour. Break camp early and park at the Leamington Fair Grounds in order to join the bus tour.



## CAMPERS - Continued

London - Fanshawe, 10 mi. North of Hwy 401 at Interchange 21 (Masonville, 5 mi. East of Hwys 4 and 22). We urge all families to stay over at the Holiday Inns on June 26th in order to take advantage of the buffet and round-table since London is a 1 1/2 to 2 hr. drive from Leamington.

Norfolk - Turkey Point Provincial Park - 4 mi. East of Delhi on Hwy 3 and 9 mi. South.

## APPLE TREE SURVEY

"The Jonathan has been replaced by the Delicious as the leading variety of apples in Michigan. Delicious accounts for 26 percent of the total apples, while Jonathan accounts for 24 percent. This shift in the leading variety occurred largely because of the heavier planting of Delicious in the past several years. From 1963-67, Delicious accounted for 31 percent of the total trees planted compared to Jonathans' 15 percent. Delicious, as discussed above, includes both red and common strains.

Large plantings of apples have been made during the past nine years, especially since 1962. Over 32 percent of all apple trees were planted from 1963-67. In the southwest fruit district, which accounts for 37 percent of the total apple trees, over 35 percent of the trees were planted from 1963-67. The west central fruit district accounts for one third of the total apples, and one third of these were planted from 1963-67.

The number of dwarf and semi-dwarf trees, including spur types, is increasing rapidly. They account for 31 percent of the total apple trees in Michigan orchards. From 1960-67, over three-fifths of the total apple trees planted were of these types. In 1967, they made up nearly three-fourths of the planting. Of the total Delicious trees planted since 1959, almost three-fourths are of the dwarf, semi-dwarf or spur types.".....*Michigan 1968 Fruit Tree Survey.*

## HIGH DENSITY CARE

With more trees planted per acre each year of apple cultivars on controlling rootstocks, it is very important to start early holding these trees in their preallotted space. Grow the trees well and prune judiciously until they begin to fruit and then begin the grow and hold and fruiting program. Allow the trees to fruit three or more years before they fill their space in the row by removing some annual growth in addition to the removing of certain poorly spaced scaffold branches.

If the growing and holding practice is delayed, fruiting is also delayed resulting in increased vigor if heavy pruning has to be done in one year. This being the case, especially with vigorous varieties on the more vigorous rootstocks, and on nutrient rich soils, June pruning is one way to slow down the trees without inducing added vigor. June pruning reduces the total tree leaf surface causing a reduction in growth. This can be done by "nipping" present shoot growth in half and even removing a part of an entire branch depending on the size and age of the tree. Do not neglect the young trees, watch tree vigor, annual growth and fruiting progress of the high density plantings and correct tree vigor before it is too late.....*R. F. Carlson, M.S.U.*

## BRANCH BENDING

June is a good time to spread branches of the vigorous upright growing apple varieties. This will help to shape the trees and cause them to fruit a year sooner. Various methods can be employed such as: the use of stiff wires cut at different lengths, notched laths, weights, and tie-down clips put into the ground, etc.



## ORCHARD HEATING - CONDENSED FROM JAMES BALLARDS' PAPER

In addition to the anti-smoke attitude, the changes in orchard heating equipment also involve labor-saving techniques.

The action is not just with the orchard heaters. There is active interest in developing new and improved overtree wind machines. There is also interest in overtree sprinkling, coverage by foaming, "fogging" with stabilized steam and humidification. All these techniques, theoretically, promise an easier way to fight frost.

The acceleration to clean up and to make this job more pleasant and safe started with the growers in Yakima Valley in 1966. There is active legislation in many counties outlawing the smokey heaters. In Yakima County, Washington, an air pollution ordinance defines 1970 as the last year we can make smoke.

*Heater types* - In the oil fired heaters, five manufacturers advertise centralized pressure systems. All of them pipe the oil under pressure to the heaters where the fuel is atomized through regular furnace jets. The manufacturers have come up with a large variety of combustion chambers varying from almost open flame heaters to very sophisticated radiant heaters.

Experience in the frosty Yakima Valley has shown that radiant heat is a very valuable asset on the most critical nights. Those heaters with the greatest radiant output usually will not pierce the ceiling as fast as those that convert most of the energy to convectional heat. Therefore, most of the Yakima Valley growers are looking for an efficient heater that has the highest percent conversion to radiant output.

*Heater research* - Research at the various state universities throughout the United States on petroleum blocks, in essence, proves this "efficiency" fact. The petroleum blocks tested emit over 80 percent of their energy as radiant heat. Leaf temperature in these heated blocks, was, on the average, consistently one to two degrees higher than in the areas heated with other methods having less than a 30 percent radiant fraction.

Dr. Art Jones, Physical Engineer, W.S.U., used a delicate radiometer to measure the direction and percentage of the radiant output. The readings varied from 21 percent to 46 percent radiant ability on the heaters that have 99+ percent combustion. The remainder percentage would be the convectional heat fraction.

*Heat efficiency* - Too much emphasis on this radiant ability may overshadow the importance of convectional heat. It is a well-known fact that many small open fires in an orchard will do a good job of frost injury prevention and that this performance is primarily convectional heat.

Why, then, the emphasis on radiant out-put? Greater efficiency is the answer. Energy radiated horizontally through the trees is more efficient at heating buds than convectional heat which rises rapidly above the trees or is blown out of the orchard by wind. In addition, the centralized fuel systems (these include overtree wind machines as well as piped fuel systems) offer greater efficiency through a large savings in labor.



*Heater Fuels* - Two fuels are competing for centralized fuel systems - fuel oil and propane gas. The supply lines for natural gas are not adequate to offer much hope of availability for the majority of fruit growers in Washington. Parts of Colorado and Utah offer more opportunity to use this fuel. Natural gas is without doubt the most desirable and economical of all orchard fuels.

The increasing popularity of propane has been accelerated by the Western Propane Company's development of large storage holdings near Warden, Washington. They are making storage tanks out of the abandoned, underground rocket silos. Now their storage holding is 12 million gallons and they are undergoing further development to double this capacity.

*Heat Cost* - The popularity of propane has increased many fold during the past two seasons. When one compares propane with oil on the BTU cost basis, it costs approximately twice that of oil (1968 Yakima prices). Its main advantages include being clean, convenient to handle, and able to produce a higher skin temperature of the combustion chamber.

One disadvantage propane has is the chilling of the liquid as the propane gas is drawn from the tank. When heavy use is demanded of the storage tank, the liquid will chill to the point of "freezing up". This is remedied by applying heat to the tank.

*Tank Warmers* - New efficient "tank warmers" have been developed to do this job safely. The tank warmer consists of a galvanized jacket under the propane tank. The jacket contains water which encloses a propane tube heater. The heater warms the water which in turn transfers the heat to the liquid propane. This principle burns about one gallon of L.P. for each 40 gallons dispersed to the heaters.

*Heat Distribution* - The Battelle Northwest Institute made the statement that a program should be undertaken to develop a heater which distributes the major fraction of its heat by radiation, and in which most of the heat so distributed is directed toward the tree.

Mr. Eric Wilson, Extension Engineering Specialist at the Prosser Irrigated Agriculture Research and Extension Center, in his study revealed that the heater should be a tapered, vertical stack radiating its rays towards the fruiting area. It should have a deflector on the top to retard the exhaust gases or deflect them downward. The heater should be made of black wrought iron so that it would have the greatest emissivity (radiant ability). Galvanized metal has a poor radiant ability. The heater should maintain the highest skin temperature possible within the limits of complete oxidation, and all the combustion of the fuel should take part inside the heater rather than in the exhausting gases.

*Heat Flexibility* - The heater burning rate should be flexible so that the heat can be turned up or down or completely off from a central control point. Several of the new commercial heaters now offer this with the added advantage of having electrical igniters for automatic lighting. One of the gas heaters has a special pilot light that burns very little fuel and is wind-proof.



*Suggestions to Growers* - Only after careful examination of all the heater facts can the grower decide which system is best for his orchard needs. Many Washington growers have decided the price is too high--in excess of \$400 per acre--and are making their own heaters. Most of these are utilizing propane fuel. The various combustion chambers being made vary in cost (including labor for construction) from \$2 to \$4 per heater. The burning rates vary from as low as 10,000 BTU/hour to as high as 125,000 BTU's per hour.

In those Washington State orchards requiring frost protection, the average critical night demands a fuel consumptive rate of approximately 5,000,000 BTU's per acre hour. Some orchards near Yakima burned in excess of 7,000,000 BTU's per acre/hour last April and still failed to save their crop during the disastrous arctic air mass freeze..... James Ballard, Hort. Agent, Yakima, Washington.

#### ANNUAL HORTICULTURAL CONFERENCES

June 26-27, 1969 - Annual Orchard Tour - Ontario, Canada. (See program in this Newsletter)

June 28-July 1, 1969 - 34th Annual Meeting, National Apple Institute, Clairidge Hotel, Atlantic City, New Jersey.

December 2-4, 1969 - Annual Conference Michigan State Horticulture Society, Pantlind Hotel, Grand Rapids, Michigan.

March 2-3, 1970 - 13th Annual Conference Dwarf Fruit Tree Association, Statler-Hilton Inn, Benton Harbor, Michigan.

March 18-25, 1970 - 18th International Horticulture Congress, Tel Aviv, Israel.

#### TEAR SLIP

Because of the potentially large number of persons attending the tour and the necessity of arranging for buffet and bus facilities, we would appreciate receiving the attached tear slip by June 15th.

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Send to: Dr. G. M. Weaver  
Canada Agriculture  
Research Station  
Harrow, Ontario

I will be attending the southern Ontario tour of the Dwarf Fruit Tree Association.

Number of adults \_\_\_\_\_

Number of children \_\_\_\_\_

Please reserve \_\_\_\_\_ buffet & round table tickets at \$5.00 each.

\_\_\_\_\_ Essex tour tickets at \$1.50 each.

\_\_\_\_\_ Norfolk tour tickets at \$1.50 each.

Name \_\_\_\_\_

Address \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_







Tour Map - Norfolk County





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## TWELFTH ANNUAL CONFERENCE - DFTA

The attendance at this year's annual conference of the Dwarf Fruit Tree Association was the largest in the history of the Association. The conference rooms of more than 500 seats at the Statler Hilton Inn at Benton Harbor, Michigan, were filled to capacity during the formal programs. The various orchard demonstrations held at Hill Top Orchard and four other locations in southwestern Michigan attracted over 700 fruit growers and horticulturists.

## NEW OFFICERS AND DIRECTORS - DFTA

*John Bell, Jr.*, Barrington, Illinois was elected president of the Dwarf Fruit Tree Association to serve the next two years, taking the place of *George Whaley*, Ruthven, Ontario, past president and now a director. *Ken McDonald*, Martinsburg, West Virginia, was elected vice-president. *Everett Lutz*, Lawndale, North Carolina, was elected to the Board of Directors replacing *Rufus Prince* of Turner, Maine, for one year. Other directors are: *Richard Mattern*, Pennsylvania; *Lorne Doud*, Indiana; *Gordon Yates*, Minnesota; and *Henry Bennett*, New York. *Wallace Heuser*, Michigan, is treasurer and *Robert Carlson* is the secretary.

## HIGH DENSITY ORCHARDS - CONDENSED FROM G. S. ROOSJE'S PAPER

Prior to and shortly after World War II many plantings of apples were planted using vigorous rootstocks as permanent trees and EM IX as filler trees. After 6 to 8 years, the permanent trees were removed and more trees with EM IX rootstock were planted in their place. Since 1950 the permanent/filler system of planting orchards has been discarded.

Table 1. The increasing importance of EM IX in Dutch orchards from 1950 to 1967.

Years Planted	Number of Trees (X 1000)	Percent Trees on Different Rootstocks					
		IX	II	IV	VII	Sdlg.	Other
1951-52	959	15	12	21	17	16	19
1952-53	765	16	13	21	6	13	31
1965-66	2170	56	15	12	9	0.2	8
1966-67	1849	63	14	8	6	0.1	8



The interest in EM 26 with a vigor between EM IX and VII is increasing, but it appears now that the use of EM 26 will be restricted under Dutch conditions. All the MM-types are too vigorous for regular varieties, but may be used in limited ways for the spur type Golden Delicious in Holland.

So we learned by experience that a small and open tree is necessary for Golden Delicious in our climate -- and marginal for the variety.

Another reason for smaller trees is to increase the production per man hour. Modern orchards should, if managed properly, have a production of 90 pounds of fruit per man hour input.

To accomplish this, consider the following:

1. Increase production per acre by improved management.
2. Reduce required man hours per acre by substitution of machines in cultural practices.

Table 2. Examples of man hours expended in pruning of trees at different tree spacings.

Tree Spacing (ft.)	Number of Trees/acre	Pruning hours per acre (av. 1965-66)
26 x 26	60	87
23 x 20	95	63
20 x 20	110	64
13 x 13	240	54
16 x 10	260	49
13 x 10	330	47
13 x 6.5	500	36
12 x 3.5	1100	24

As far as picking is concerned, the smaller trees closely spaced are easier to pick and with less bruising. For example, trees in their sixth year could be picked at the average of eleven bushels per man hour.

Yields are important in reducing man hours, and increase total income per acre. The following tables show some of these relationships.

Table 3. Yields of Golden Delicious/EM IX planted in 1962 at Ulestraten Station.

Year after Planting	1200 Trees/A	686 Trees/A	450 Trees/A
	Bushels per acre		
2	80	-	-
3	393	251	142
4	840	627	390
5	1600	1135	895



Table 4. Yields in commercial orchards with different tree densities of Golden Delicious/EM IX.

Year after Planting	Zuyler Orchard 960 Trees/A	Reinder Orchard 1200 Trees/A
2	60	280
3	320	625
4	795	1065
5	1120	1340
6	1600	1530

These are some of the facts which have been developed in the past several decades. In high density plantings, certain optimal tree numbers per acre depend on individual growers capabilities. Several cost and management factors are the basis for success in high density orchards.....G. S. Roosje, Research Station, Wilhelminadorp, Holland.

#### COLLAR ROT CONDITIONS IN MICHIGAN ORCHARDS

The collar rot disease which occurs in other apple growing regions recently has received considerable attention. Pathologists in those areas have diagnosed the cause to be Phytophthora cactorum, a soil-borne fungus. Because many of the dwarfing rootstocks, especially those of the Malling Merton series, are susceptible to this disease, the potential importance of the problem is of concern to the Michigan apple industry. In 1968 tree losses were above normal.

There is danger, however, in assuming that all root and collar problems are caused by the same organism reported from Washington and Missouri. Injuries resembling Phytophthora collar rot are caused also by the fireblight organism, by Armillaria root rot, and by other pathogens rarely found in Michigan. Physiological factors, particularly waterlogging, low winter temperatures and excess use of chemical fertilizer led to root problems resembling those caused by pathogenic organisms. Usually extensive examination and study is required to determine the specific cause of the problem in a particular orchard and frequently, more than one cause may exist in a planting.

This report is a summary of observations made in several orchards in 1968.

#### Symptoms of Collar Rot

Tree decline was evident at various times during the growing season, but the most striking symptoms were noted at harvest or a little later. At this time affected trees showed bronzing, purpling, or yellowing of the foliage. Apparently healthy trees, however, had normal green foliage. Terminal growth and leaf size were reduced on affected trees.

Closer examination of the root system of trees with above ground symptoms revealed the collar and often the adjacent roots had been killed. Dead tissue sometimes extended from the stock-scion union downward, involving all portions of the root system. Other times damaged tissue only occurred at or below ground level.

Not only were a number of the popular East Malling and Malling Merton rootstocks affected but trees on seedling rootstocks were involved as well. In fact, more dead trees were noted on seedling rootstock than on clonal rootstocks. Incidence of death varied from one or two percent to approximately 30 percent.



### *Conditions Associated With Affected Trees*

Incidences of tree mortality were highest in areas of the orchard where a hard pan or clay soil caused poor internal soil drainage. Trees on the edge of these wet spots were affected less than those in the center of the poorly drained areas. Injury was slight or absent in the higher parts of the same orchard.

Although drainage was acceptable in some instances, problems were noted where water was allowed to accumulate in depressions near tree trunks. Shallow basins for watering newly planted trees in summer and holes resulting from tree movement in loosely packed soil were found frequently in orchards where isolated trees were dying. In one planting, the upper 1/2 to 1/3 of the planting hole had been filled with coarse stone, thereby allowing water to accumulate around the crown during wet periods. These problems should and can be avoided by leveling the soil in areas around the base of the tree in fall and then covering with gravel as required to protect against mice.

### *Probable Causes of Collar Rot*

The symptoms and the conditions associated with the tree mortality problems observed, suggest winter injury as the primary cause of collar and root rot difficulties in Michigan. Collar winter injury is severe when a wet period is followed by a severe cold period similar to what occurred in the fall of 1967. Prolonged wet weather late in the season is unfavorable for proper tissue maturity and winter hardiness. Vigorous non-bearing trees on saturated soil seemingly would be the most susceptible to low temperature damage.

In view of the reports of Phytophthora collar rot from Washington, Missouri, and British Columbia, Canada, it seemed desirable to examine damaged stems for the fungus. Repeated but unsuccessful attempts to isolate Phytophthora from apple collar lesions and from soils were made using standard methods for isolating the fungus. In fact, questionable looking crowns sent to our pathology laboratory have never yielded this organism.

EM VII has been grown in Michigan for about 20 years without major criticism because of collar rot even though it is moderately susceptible to Phytophthora. One factor known to contribute to Phytophthora problems is irrigation. Michigan does not irrigate, but it is a standard practice in Washington and is practiced extensively in some orchards in Missouri. As the trend towards size controlling rootstocks increases and interest in irrigation intensifies, conditions may develop which will favor this fungus and result in collar rot. The association of collar winter injury with heavy soils here in Michigan and the association of Phytophthora collar rot with heavy soils in Washington, suggests care in the selection of orchard sites as a must if tree mortality problems are to be avoided in the future. For potentially good sites where internal soil drainage is a problem, tiling or possibly subsoiling may be helpful to correct this difficulty. Elimination of drainage problems is best done before planting. ....Alan Jones, Plant Pathology, M.S.U.

### COLLAR ROT - SEASONAL AND VARIETAL DIFFERENCES

Apple varieties vary in their susceptibility to the collar rot disease from the highly susceptible Grimes Golden to the relatively resistant EM IX rootstock. Susceptibility within a variety is complicated by seasonal differences. Most varieties have a low susceptibility during the dormant period but in late April exhibit a high



degree of susceptibility. Another period of susceptibility is in early September; while relatively low susceptibility levels occur in late May, late June, and early October. Chemicals for control, therefore, should be applied in mid-March to early April and again in late August. If limited to one application, then it should be in early Spring rather than early Fall. Dexon at 200 ppm on non-bearing trees and copper chelate at 150 ppm for bearing trees provide protection. Applications should begin with initial plantings of susceptible rootstocks such as EM II, VII, MM 104, and MM 106 when replanting old orchard sites. If the planting is on new ground these treatments should begin about 3 years after planting. Trees 8-10 years of age no longer need any treatment.....D. F. Millikan, Plant Pathology, University of Missouri.

#### GROWER'S EXPERIENCE WITH COMPACT TREES

We planted our first semi-dwarf apple trees in 1960 mainly because of the dwindling migrant labor supply. The available labor was used in the orchards with the smaller trees, and thus it became more difficult to get the large trees harvested. We felt that with the smaller trees, we could attract and hold a larger share of local labor. This has proved to be true.

Another advantage to us of the semi-dwarf tree, is earlier commercial production. Varieties such as Red Delicious and Northern Spy that are inherently slow in coming into production can produce crops of commercial size in the fifth year for us.

Furthermore, we also find that the semi-dwarf tree takes less pruning and due to its flexibility in layout, we have less wasted land in our orchards. We have planted varieties on EM VII 15' x 25', and 18' x 22', and feel the latter is more desirable.

In the fall of 1960 we planted Double-Red Delicious, Rogers-strain MacIntosh, Double-Red Jonathon, and Northern Spy on EM VII. We have been well pleased with the Northern Spy and the MacIntosh, which produced this year, an average of five bushels of high quality fruit per tree. The Double-Red Delicious have developed a tipping problem, and more seriously, measles.....especially the Bisbee strain. Damaging spring frosts held production in this block to two bushels per tree last year.

The first semi-dwarf trees we purchased had graft unions very close to the root. In order to plant the graft union the prescribed two-inches above the ground, the roots were very shallow, and serious suckering problems developed.

The Double-Red Jonathon on EM VII has been totally unacceptable to us because it was impossible to maintain a central leader, causing the trees to develop into a small bush. We have, subsequently, planted Red Jonathon on EM II, and find that to be better. However, when headed low to prevent tipping, and because of its precocious growth, it is difficult to keep the lower limbs from lying on the ground when laden with fruit. We are planting Northern Spy on both MM 106 and EM VII, and at this time they look equally promising.

In 1964 we planted the new variety Wayne on both EM VII and MM 106. This apple comes into production early in MacIntosh season, but it has for us two unfortunate characteristics. 1) It is highly susceptible to fire-blight. 2) It does not shed its leaves in the fall like the other apple trees do. As a result, during a wet fall with corresponding high winds, which is not unusual in Northern Michigan,



the trees are loosened in the ground and a tipping problem is created. This is more apparent with the EM VII rootstock as compared MM 106.

The cultural program that we follow is clean cultivation in the orchard for the first three years. In the fall of the third season, we establish a seeding using ten pounds of Kentucky Blue grass per acre.

Weeds around the tree are controlled by a herbicide program consisting of one application per year of two pounds of Simazine and two quarts of Amitrol T.

Three things have been particularly gratifying to us in the production of apples on semi-dwarf rootstocks. 1) We like the attractive appearance of our orchards with even rows of fast growing trees. 2) It is much easier for us to recruit labor to harvest these trees that are heavily laden with large apples, practically without the use of ladders. 3) We are proud of the quality and the size of fruit these trees are producing.

We are convinced that we made the right decision back in the fall of 1960. We have had some problems, but for the Morrisons, the commercial dwarf-tree orchard is here to stay.....*Peter Morrison*, Traverse City, Michigan.

#### TREE SPACING - NATURAL DIMENSION FACTORS

A basis on which to judge the best rootstock and variety combination for the soil and culture of the orchard should be considered prior to planting. To accomplish this numerical values can be given to the most significant factors for tree size.

Tree spacing depending on cultivar rootstock and soil as shown by the natural growth factor in feet.\* /

Cultivars (In order of natural vigor)	Natural Growth Dimensional Factor (ft.)		Rootstocks (In order of increasing vigor)
Rome, Spur Golden Del.	2	2	EM IX
Idared, Spur Red Del., Quinte	4	4	EM 26
Jonathan, Golden Del., Lodi	6	6	EM VII
Red Del., Spartan	8	8	MM 106
McIntosh, N. Spy, Mutsu		10	MM 111 and EM II
R. I. Greening, etc. (Other varieties can be added to this short list accordingly)	10	12	MM 104
		14	Seedling and Robusta-5
<u>Soils (Orchard site)</u>			* / Additive dimensional factors:
Low Productivity	2		cultivar + rootstock + soil =
Medium Productivity	4		spacing distances between
High Productivity	6		trees. To obtain the spacing between rows add 8 ft. to total.

Examples: Red Delicious/MM 106 on medium soil -  $8 + 8 + 4 = 20$  feet between the trees in the row - plus 8 = 28 feet between the rows or 20 x 28 feet.  
Jonathan/EM II on low productivity soil -  $6 + 10 + 2 = 18$  feet + 8 = 26 feet or 18 x 26 feet.  
Spur Golden/MM 111 on medium soil -  $2 + 10 + 4 = 16$  feet + 8 = 24 feet or 16 x 24 feet.



By adding together the numerical value given to a variety, a rootstock, and a soil category, you get the ultimate natural spread of your tree at maturity. This is what may be called the natural dimension factor.

The natural dimension values may vary a little from area to area. For example, on the west coast these dimensions might be 10 percent greater, and in the east, 10 percent less than the values stated in this schedule. Also, note that the values given in this table are on the assumption that any orchards planted today must not be neglected. Young trees should be kept in a weed-free or mulched environment and adequately nourished and should not be allowed to crop until the 4th year. Heavy cropping of young trees, especially in varieties like Idared and Golden Delicious and Spur varieties will stunt the trees and make it difficult to achieve their size and production potential.

#### ORCHARD PLANTING PLANS CLASSIFIED

1. *The conventional or low density.* In this class the pruning and training will be minimal and little attempt at supplemental size control will be practiced. This style requires the least work, the least investment per acre and means the least return per acre, especially in the first 12 to 15 years of an orchard's life.
2. *The medium density.* This class is for the moderate "mold and hold" or modified hedge-row system. It is based on the fact that the natural dimension of a tree can be contained or reduced 25 or 30 percent without a radical departure from generally accepted cultural practices. In this plan the trees should be trained to a modified central leader. As the trees approach the limits of the area designed for them, fertilization is diminished and heading back of longer branches begins, and an attempt is made to leave and encourage more fruiting wood on the interior of the tree. This plan requires some additional work, a slightly higher investment per acre, and a grower commitment to give proper attention to training and ultimately to pruning, with a balance of feeding to keep wood growth moderate. This system should provide a 50 percent greater yield than the conventional low density planting in the first 12 years of the orchards life, and probably, 200 percent of the profit in that time.

Using the same examples of variety, root and soil combination as given for the conventional system, the average recommended spacing for this medium density style would be 6 feet less each way. Therefore, the spacing should be 14 x 24 feet or 130 trees per acre.

3. *The high density.* This class is the hedge-row planting, which will include several different methods of handling such as trellising, palmette, individual staking, the spindle-bush or christmas tree type of training and the off-set, double hedge row. Tree populations will usually run from 300 to 500 trees per acre. The most practical design seems to be a medium density hedge row with medium vigor stocks, perhaps free standing. A practical spacing seems to be 8 x 14 feet or 388 trees per acre. Maximum width would be 6 feet with ultimate tree topping at 12 or 14 feet. It is anticipated that picking platforms can be used in this type of planting. In these orchards medium vigor combinations should be used with a Natural Dimension Factor of 12 or 14. This system is not well suited to MacIntosh or N. Spy, but could be quite practical for Idared, Spur Red or Golden Delicious and Quinte.



## ADDITIONAL COMMENTS

The high density hedge-row planting offers the greatest profit potential for the varieties mentioned. But these systems require a careful and complete cultural program including availability of irrigation on most soils. These systems also require a positive grower commitment to this type of culture and this must not be neglected.

It should be profitable for many growers to try up to an acre of high density hedge-row to gain experience with it and to find out if it is practical on a commercial scale. If done properly, the profit potential is probably four times that of the low density conventional system.

The increase in net income available in medium density plantings cannot be ignored.....George P. Whaley, Ruthven, Ontario, Canada.

Ed. Note: A suggested name for this Natural Growth Dimensional Factor: The Whaley NDF tree spacing system.

PERSONAL NOTE: Richard Mattern, Holidaysburg, Penna., a fruit grower and director of the D.F.T.A., was selected Master Farmer in 1968. His orchard is largely of the compact sort. Being in an area where spring frost can be a problem, Mr. Mattern is contemplating installing a permanent heating system with natural gas. Congratulations, Dick!

## 1969 - SUMMER ORCHARD TOUR

The dates of this tour are Thursday and Friday, June 26 and 27. Visits will be made to the Ontario Research Station at Harrow. Peach rootstock research, pear research and tree spacings will be some of the items seen and discussed at this station. The Fruit Tree Research Station at Simcoe will be another stop to see some research in progress. Commercial orchards in the vicinity of these stations will also be part of the tour.

Aside from the day-tours, there will be an evening of discussions Thursday following dinner at the Holiday Inn near London.

An excellent program is being planned by growers, extension and research personnel in Ontario. The details of this program will be in the next Newsletter.

Those coming needing lodging Wednesday, June 25, should contact Holiday Inn, Windsor, Ontario, Canada, and reservations for Thursday, June 26 - Holiday Inn (near 401) London, Ontario.

## NEW PUBLICATION AVAILABLE

*Characteristics and Propagation of Rootstocks for Deciduous Fruit Trees in the North Central Region*, 1966-67. By R. K. Simons, Illinois, and R. F. Carlson, Michigan.

This publication in *HortScience* lists in table form, based on a survey, the number of rootstocks budded or grafted in the region for one year 1966-67. It also has a descriptive narration of rootstock characteristics of the major fruit tree rootstocks. A limited number of reprints are available free by sending a card to Room 303, Dept. of Horticulture, M.S.U., East Lansing, Michigan 48823.

ROSTER--- A membership roster will be published this summer. Since this will include 1969 members, the treasurer reminds those who have not paid these dues to do so in order to be included in the membership listing. Make checks payable Dwarf Fruit Tree Assoc. and mail to P.O. Box 143, Hartford, Michigan 49057.



Department of  
Horticulture

MICHIGAN  
STATE  
UNIVERSITY

# COMPACT FRUIT TREE

DWARF FRUIT TREE ASSOCIATION

Rootstock Behavior

Spur Types

Induced Dwarfing

Cultural Practices

Vol. 3, No. 8, November 1969 Edited by R. F. Carlson

## ROOTSTOCK INFLUENCE ON FRUIT COLOR

Rootstock influence on fruit color and ripening previously has been observed in both experimental and commercial orchards. This fact is important especially with a variety such as McIntosh which does not color well in some areas.

In a test orchard planted in 1965 at MSU-Horticulture Research Center, fruit from McIntosh trees on 7 different rootstocks varied in fruit color and degree of ripening. It was especially noticeable that the apples on MM 106 began to color earlier and developed more uniform and intense red color throughout the tree than fruit from other trees on different rootstocks.

The apples were picked October 1st which is rather late for this variety. Fruit pressure test taken of this fruit after 2-weeks storage also showed that the more vigorous rootstocks had firmer fruit and less color.

Fruit pressure test and color rating of McIntosh  
on 7 rootstocks in the fifth year.

Rootstock	Fruit pressure	Color rating <sup>*/</sup>
Seedlings	12.61	4
Malling Merton 113	12.53	4
" 103	12.39	3
" 102	12.13	2
" 105	11.78	2
" 101	11.49	4
" 106	10.86	1

<sup>\*/</sup> 1 = Very uniform red color -- all fruit.

2 = Good color -- few green fruit.

3 = Fair color -- more green fruit.

4 = Poor color -- many green fruit.



## PRUNING COMPACT APPLE TREES

In pruning compact trees there must be a knowledge of: 1) variety growth and fruiting characteristics, 2) rootstock influence on the variety, 3) condition of the orchard site, and 4) influence of added nitrogen on tree growth and fruiting. Furthermore, how little or much the variety is pruned annually depends on the permanent tree spacing and tree height.

Due to some of these conditions each variety requires a little different pruning approach than the other varieties. A sequential pruning program for McIntosh/MM 106 is as follows:

First year - At planting time select 2 to 3 of the best scaffold branches on the central leader. Head back these and the leader to form a well balanced tree. If the lateral branches are poor remove all of them, and head the leader. Time required - 1 minute/tree.

Second year - Select one or two more laterals and cut out any undesirable shoots. Do not over-prune. Remove fruit from top of central leader. Time needed - 1 minute/tree.

Third year - Five to 7 well spaced scaffold branches should now be the aim. Eliminate the poorly spaced and sharp crotch angled branches. Lightly head back any permanent branch which is tending to take the lead or spread too fast. The central leader may also need to be headed to a lower side shoot to keep the tree in balance. Time required about 2 minutes/tree.

Fourth year - The lowest scaffold branch should be 15 inches from the ground. In the fourth year this branch may be too close to the ground and should be either removed or headed back to an upright growing secondary lateral. Cut out any unwanted shoots, but do not trim out short fruiting branches which appear on the central leader and on the scaffolds near the leader. Keep the tree full. Time required 2 to 3 minutes/tree.

Fifth year - At this time McIntosh/MM 106 should have borne enough fruit so that the branches are in a nearly horizontal position. The uppermost branches may have secondary laterals which are growing too vigorously upward and outward. Head these back to a downward hanging branch. Check the central leader to see if the tree is as "tall" as needed under the particular spacing system used. If so, remove it above a strong fruiting lateral. Cut out superfluous branches leaving young fruiting branches undisturbed. Time required - 4 minutes/tree.

Sixth year - Appraise the growth and fruiting occurred since the last pruning and make minimum cuts if crop was light, in order not to induce excess tree vigor. However, any unbalanced vigorous leaders or branches should be reduced back to a downward growing lateral. Check the lower branches and prune them to an upward growing branch if they interfere with weed spray equipment. Time required - 6 minutes/tree.



Seventh year - Begin to renew fruiting wood by removing part of, or an entire original scaffold branch. Often a young branch near an old one will take the place and be ready to fruit in a year or two. Do not remove excess large branches in a single year since this tends to induce vigor and reduce fruit potential of the whole tree.

Eighth year - By this time the trees have filled their allotted space in the modern system of tree spacing. So from now on it becomes a matter of following a pruning system which will hold the trees in its space, form and shape without reducing yields. As described for 6th and 7th year, judge the amount of pruning by the vigor of the tree and previous year's cropping. Assuming these trees are harvested by hand, it becomes necessary to remove a branch on one or two sides to give fruit color and to facilitate picking.

Ninth year - McIntosh is a vigorous variety and can easily get out-of-reach, especially in low crop years. MM 106, however, keeps this variety fruiting annually. Overly vigorous branches should be removed to allow the smaller younger branches to carry some of the fruit load.

Tenth year - The pruning pattern now established of heading back, holding, renewing fruiting wood, and thinning out non-fruiting or unwanted branches should be followed annually on mature trees. The final shape of these trees will appear as an inverted flat-top ice cream cup. Time required to prune these mature trees (from the 7th year) should be about 10 minutes/tree, or 200 trees per acre, about 33 to 40 man-hours per acre.

Some of the other varieties which would fit into this pruning pattern (with MM 106 rootstock) would be: Paulared, Golden Delicious, Jonathan, Cortland, Rome and others in the same vigor range. Red Delicious and spur-types require somewhat different pruning as described later.

In general, less pruning is needed with the more dwarfing rootstocks, such as EM VII, EM 26 and EM IX. However, such being the case, varieties on them will need similar detailed training and pruning from planting time to maturity. ... R. F. Carlson

#### PRUNING IN ALTERNATE YEARS

A. P. "Tony" Preston has summerized pruning in alternate years, in England, stressing these points:

1. About the same amount of wood was removed from trees pruned in alternate years as from those pruned annually.
2. In general fruit size was not affected by pruning in alternate years, however, in a year of heavy fruit set, a higher percentage of small fruit could occur in trees pruned every other year.
3. Pruning 'established-spur' trees in alternate years increased yield of the Cox Orange Pippin without affecting fruit color.



4. It would be unwise to leave the trees unpruned for more than one year because this might lead to excessive fruit set and small fruit. J. Hort. Sci. 43:351-357, 1968.

#### SCAFFOLD RENEWAL PRUNING

In 1968 A. D. Crowe, Kentville, Nova Scotia appeared on the program of the DFTA. He also demonstrated the scaffold renewal system of pruning. This system certainly has a place in the present trend of keeping trees small. Dr. Crowe describes the method as follows:

"This is a very simple method. In fact, its very simplicity seems to be an obstacle in understanding. First one must clearly understand the principle outlined earlier that pruning should be aimed only toward developing and maintaining a serviceable structure. There is no economic advantage in thinning out the smaller branches for the benefit of the current season's crop unless fruit size is a problem.

The scaffold renewal method is designed for trees which will occupy a space of not over 20 feet in the row and preferably only 12-15 feet. Variety and scion combination should give a vigor which will normally produce a tree about 1/3 larger than this allotted space, but the tree size is held down by the pruning.

With the land area well covered by the tree, it is not important if minor mistakes are made as new limbs will soon grow in and, meanwhile, the sunlight is being utilized by leaves on other branches. Make large cuts. Any branch which is getting too high or too far out and over, should be completely removed. Usually this means the removal of from one to three such branches per year. Some tidying up may be done, but will not really be necessary. Do not remove bottom branches, but head them back as necessary with loppers to an upright-outgoing shoot which will in turn be brought down as it crops. Thickness of individual branches will not be a problem since a) the tree will be small enough for light to get in and through it, and b) since the branches are continually being replaced, the body of the tree will always be a young tree -- only the trunk and bases of the lowest limbs get old.

Pruning should all be done from the ground and in two steps. First go through with one of the new light-weight chain saws and cut out one to three of those largest limbs growing up and out from the tree.

An acre per man per day is easily possible. Then, using loppers, do a little tidying up, removing only the very vigorous water sprouts from the inside of the tree, the down-hanging ends of the limbs, plus a little heading back if necessary. This latter step is not critical to the success of the method and care should be taken not to spend too long at a tree -- say 5 to 10 minutes -- and may not need to be done every year.



Experimental results with this method are very encouraging. We are presently comparing the Scaffold Renewal and Mold & Hold methods of controlling tree size and some of the results to date are given in table below -

Effect of three methods of pruning on total yield and on yield of large, extra fancy fruit. Goguen orchard, bushels per tree.

Method	Total crop			2 1/2" up, 75% red No defects		
	1966	1967	1968	1966	1967	1968
Standard	10	10	13	6.4	4.7	4.6
Scaffold Renewal	12	11	14	7.0	4.2	4.6
Mold & Hold	13	7	9	9.8	1.9	1.5

#### PRUNING POINTERS FOR VIGOROUS AND SPUR-TYPE TREES

The vigorous trees - Each variety has its own growth pattern and hence requires individual handling as to training and pruning. Often such varieties as Red Delicious, Northern Spy and Winesap are slower in coming into bearing. Heavy pruning can delay fruiting further.

First year - If the one-year old tree is branched, select and keep one or two of these branches and remove the rest. Head leader in proportion to the scaffolds. If the tree has poor branches, remove all of them and cut off top 1/3 of leader.

Second year - Prune out one or two of the poorest scaffolds. Remove triple leaders to a single leader and head this one in proportion to scaffolds. Start to put spreaders in lower branches.

Third to fifth year - Prune very lightly until the trees are coming into production. Do not head main branches back until they have spread outward about 60° from the leader. Keep spreading branches if the fruit load does not spread them. Score the trees to encourage early bearing.

Fifth to tenth year - Keep the trees compact by holding the bearing surface close to the leader. Control over-growth by heading back to a younger fruiting branch. Annual light pruning is necessary to keep the tree in fruiting condition without crowding adjacent trees.

The spur-type trees - There is much yet to be learned on how to train and prune these compact spur-type trees, because each type is different. Often, they are slow in getting started the first year or two. For this reason, the tree should be "whipped" by removing all branches and heading back the whip to about 12 to 16 inches from the ground. This invigorates the tree so that new wide-angle branches are formed the first year.



The spur-type respond to outward spreading of the lateral branches. This is done by the use of sharp 8-gauge wires cut to appropriate lengths. Laths with a V-shape cut at each end is another way of doing this. Branches trained in a nearly horizontal position develop more side shoots on them adding to the bearing surface. If branches are allowed to grow upward the tree develops poor form and shape, and usually becomes too tall and thin once it "fruits out" on its own.

As previously mentioned, how and why a tree is pruned depends on many factors which must be kept in mind when using pruning shears and saw. .... R.F.C.

#### PRECOCITY IN SPUR-TYPE TREES

Some varieties come into bearing early irrespective of the rootstock and others are more tardy in this respect. Golden Delicious is an example of early and N. Spy of a tardy variety. The more dwarfing rootstocks will change the precocity of the variety to some extent. When EM IX is used as a rootstock fruit initiation often occurs the first year in the nursery.

Recent studies at the MSU Horticulture Research Center reveals that spur types of Golden Delicious on their own roots will fruit as early as when on MM 111, a semi-dwarf rootstock. This fact may be of significance with precocious varieties once a rapid method of propagating them by vegetative methods is developed.

#### OVER-PRODUCTION OF GOLDEN DELICIOUS

From France comes the information that over-production of apples, especially Golden Delicious is forcing some growers out of production. This, coupled with low prices and inferior quality of Golden Delicious, has made growers change to other varieties and to reduce their plantings. The large plantings in southern France in a warmer climate and under irrigation set some 10 to 15 years ago are not all profitable.

The non-colored apples have been very popular in Europe in the past. However, now, the red sorts are coming into the modern plantings -- such as, spur-types of Red Delicious, Red McIntosh, Spartan, Tidemans Early Red, Red Boskoop and others.

The French nurserymen are well informed and aware of the variety change and trends and introduce modern and recent cultivars and mutations from all parts of the world. These are propagated mainly on EM IX and MM 106 rootstocks and such trees are grown and trained as spindle bush or palmette forms in the orchard.

#### PLANS FOR ANNUAL CONFERENCE

The Board of Directors of the Dwarf Fruit Tree Association will meet Wednesday afternoon, (3:30 pm) December 3, 1969 at Pantlind Hotel, Grand Rapids to make detailed program plans for the March 2-3, 1970 conference.



## THIRTEENTH ANNUAL CONFERENCE - MARCH 2 AND 3, 1970

The program's general theme of the 13th annual conference of the Dwarf Fruit Tree Association will be "How to Live with Compact Trees." Prominent out-of-state and in-state speakers and panel members will make for an interesting program. Mr. A. P. "Tony" Preston, East Malling Research Station, England will be the guest out-of-country speaker. Tony Preston is well known among fruit growers throughout the world for his knowledge of rootstock behavior and pruning work. Since he appeared on the program of the 5th annual conference in 1962, he has spent study and lecture time in Australia, Tasmania, New Zealand, Spain and other countries.

The conference will be held at the Statler-Hilton Inn, Benton Harbor. There will be at least one half day devoted to orchard visits and pruning demonstrations. More details of the program in the next Newsletter.

### CONFERENCE DATES

December 2 to 4, 1969 - Michigan Horticultural Society,  
Pantlind Hotel, Grand Rapids, Michigan  
March 2 and 3, 1970 - Thirteenth Annual Conference Dwarf Fruit  
Tree Association, Statler-Hilton Inn,  
Benton Harbor, Michigan

### PUBLICATIONS AVAILABLE

1. *Some Endogenous Rooting Factors Associated with Rooting of Fast Galling II and Galling Verton 196 Apple Clones.*
2. *Characteristics and Propagation of Rootstocks for Deciduous Fruits in North Central Region, 1966-67.*
3. *Growth Response of Several Rootstocks to Soil Water.*
4. *Training and Pruning Dwarfed Apple Trees.*
5. *Special Cherry Research Report 1968-69.*

Address requests for above publications to: Dr. Robert F. Carlson, Michigan State University, 303 Horticulture Building, East Lansing, Michigan 48823.

### PRUNING TIME

When to prune is left up to the prevailing conditions in a particular fruit area. That is, no certain week or month during the dormant season can be set aside for pruning. In general pruning is done when the weather is compatible with the person and the equipment.

However, certain guide post must be followed in order to get the pruning done before the "spring rush."

1. Apples can be pruned anytime following leaf-drop in the fall. If many large diameter cuts have to be made, it would be best to delay this until February. The large exposed cut surface does



not heal over, but "dry out," and in such cases a decay condition is initiated which often extends a foot or more down the trunk. This is a form of induced winter injury and will vary from one year to another. Some apple varieties are more tolerant of early pruning than others. Thus, varieties such as Delicious (and strains) and Golden Delicious should be pruned last.

2. Stone fruit trees are generally more tender and subject to winter injury from early pruning. The pruning wounds tend to heal more rapidly in late winter and early spring, and therefore, stone fruits should be pruned last. In fact if only minimum pruning is needed (in the case of peach) it can be held off and guided by potential fruit set.

#### TREATING PRUNING WOUNDS

Any major pruning cut larger than 2 inches in diameter should be covered to prevent decay and drying out of the area adjacent to the wound. This should be done soon after the cuts are made. Two materials are available and can be used:

1. Grafting compound which is a thick emulsion that can be thinned with water to brushing consistency.
2. White latex outdoor and quick drying paint.

#### POTENTIALS IN HIGH DENSITY PLANTINGS

Some yields in 1969 from small young trees at the MSU Horticultural Research Center give indications of what can be obtained in acreage production.

Trees of Golden Delicious planted in 1966 were 2 feet in height and bore between 1/2 to 3/4 bushel per tree. Starkrimson Delicious of the same age 5 ft. tall bore up to 1 bushel. Both varieties were on EM 26 rootstock.

With 1089 tree/A (4x10 ft.) of Golden Delicious, the yields in 4<sup>th</sup> leaf could be between 500 to 700 bushels per acre. Starkrimson with 500 trees/A (6x14 ft.) would approach 500 bushels at the same age.

The potentials are there, but to accomplish this, and to obtain continued annual high production per acre, requires a knowledge of how to handle such tree populations.

These and other interesting points will be discussed at the 13th Annual Conference of the Dwarf Fruit Tree Association, March 2 and 3, 1970 at Benton Harbor, Michigan.

#### YOUR IDEAS AND EXPERIENCES

We are interested in your methods of fruit growing. This is an age when rapid changes in growing and marketing of fruits are taking place. We learn by doing and by exchanging ideas. Send a brief review of your ideas, and we will include them in future "Newsletters."