

terials showed significant differences in scale survival compared with the control 7 to 39 days after treatment. There were no significant differences among materials. None of the materials were phytotoxic.

Understanding of insect damage to *Annona* spp. plants is still in a preliminary phase. Additional study is necessary to develop a better knowledge of the relationship between insect pests and plants within the Annonaceae.

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## ORIENTAL PERSIMMONS (DIOSPYROS KAKI L.) IN FLORIDA<sup>1</sup>

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*Additional index words.* culture, rootstock, cultivars.

**Abstract.** Twenty-three persimmon (*Diospyros kaki* L.) cultivars were evaluated in plantings at locations in north, central and south Florida. Major disease problems included *Cephalosporium* wilt, *Cercospora* leaf spot, and anthracnose fruit rot. Biennial bearing was a problem in some cultivars. Fruit thinning and maintenance of uniform soil moisture content reduced biennial bearing and vigorous upright vegetative growth. Fruit size ranged from 3.5 to 8.8 oz. and yields from 50 to 150 lb./tree. The most promising astringent cultivars were 'Giombo', 'Tannenashi', 'Eureka' and 'Sheng'. 'Ichikikeijiro', 'Jiro' and 'Fuyu' were the most promising of the non-astringent types.

The oriental persimmon has been cultivated in Florida since the mid-1800's. Originally from China, cultivars were imported into this country in the early 19th century. Popularity in the U.S. is not great, though it is a major fruit in oriental societies. It is grown commercially in many countries and in California.

Fruit are yellow to deep orange-red and have a high sugar content. The tree is easy to grow in Florida, with a compact spreading habit, low maintenance requirements, and ornamental beauty. It is adaptable to home use and to small plantings for local production.

Persimmons may be divided into groups based on fruit astringency and fruit flesh color when seeds are present. The non-astringent types have fruit which lose their astringency while still hard, whereas fruit of astringent types must be soft or artificially treated before astringency is completely removed. The flesh color in pollination variant types has a dark tannin tissue associated with seed formation but when seeds are absent flesh is clear. Astringent pollination variant persimmons will be non-astringent in the dark fleshed seeded portions of the flesh when the fruit is still firm. Pollination

constant persimmons lack the dark tannin tissue regardless of seed formation (3, 6, 12).

Persimmon production is affected by a number of factors including diseases (2, 3), freeze damage (14), pruning (9, 10), thinning (8), fruit drop (1, 8), and alternate bearing (5, 11). *Cephalosporium* wilt (2), anthracnose and *Cercospora* (3) are major fungal diseases. Freeze injury is a problem particularly in seasons with alternating warm-cold cycles (14). Alternate bearing is common in many cultivars and is related to crop load (5), seed production (1, 5), tree age or vigor (8), soil moisture (3) and pollination (4, 5, 7).

Due to an increasing interest in oriental persimmons an evaluation of cultivar performance, disease problems, alternate bearing and fruit quality were made to determine the best cultivars for use in Florida.

#### Materials and Methods

Evaluations were made at 4 plantings in the vicinity of Gainesville and one in Monticello, Florida. Information was gathered on plantings in Naples, Wauchula, Gulf Hammock and Anthony through personal communication. The oldest planting examined was a 25-yr-old orchard near Alachua. Trees on a hillside and its crest had been top-worked to native *D. virginiana* L. rootstock. Graft unions ranged from 2 to 5 ft above ground level. Records were kept on fruit drop, yield and quality for 10 different cultivars in 1983 and 1984. Resistance to *Cercospora* leaf spot and effects of *Cephalosporium* wilt were also noted. The orchard received no pruning, insect or disease control, supplemental fertilization or irrigation. Occasional mowing of the underbrush and grass was done.

Yields and performance of 'Tannenashi' were recorded in the 1983-84 season on top-worked trees near High Springs. Grafting was done in the winter of 1982 on *D. virginiana* trees which were approximately 7-yr old with unions in juvenile wood 5 ft from the ground. Weeds were controlled with herbicides and trees were fertilized in March and June. Late summer and fall tent caterpillar infestations were controlled using insecticides. Limbs damaged by twig girdlers were removed and burned.

A 5-yr-old orchard in Chiefland was observed in 1984. Seven different cultivars were grafted to *D. virginiana* rootstock. Unions were 6 to 24 inches from the ground. A few

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of the cultivars were also grafted to *D. lotus* and *D. kaki* rootstocks. Cultural practices were similar to those of the High Springs planting.

Data were collected on fruit yields and quality in 1983-84 at the University of Florida Research Center in Monticello, Florida. Seven different cultivars were propagated on *D. virginiana* and tree performance was observed. Dormant oil was applied in February, and insecticide-fungicide applications were made in April, May and June. Observations were made on *Cercospora* leaf spot infections. Fertilization and weed control were similar to the previously described plantings.

Bloom dates and fruit set, yield and quality were recorded for 17 cultivars from 1982 through 1984 in the cultivar evaluation block at the University of Florida in Gainesville. Tree growth and performance were noted from 1980-84. All trees were on *D. virginiana* stock. Graft unions ranged from 6 inches to 5 ft above ground level. Cultural practices were similar to those of the other plantings with the following exceptions. No fungicide-insecticide sprays were applied after March. Fertilizer was applied from March through August in light monthly applications based on tree size in 1984 in order to limit rapid vegetative growth and excessive vigor. Irrigation was applied in 1984 at 1/4 to 1/2 inch every 4-7 days during dry periods to maintain relatively uniform soil moisture. In 1984 winter pruning consisted of removing excessive or upright vigorous vegetative growth. Branches that crossed or tangled and the previous year's fruiting wood were also removed. Fruit thinning of some cultivars was done from 1982 to 1984.

## Results and Discussion

**Diseases.** In the oldest orchard a significant loss occurred from *Cephalosporium* wilt. In 2 yr of observation 3 trees were killed from infections. The owner reported that over the past 10 yr other trees had died from the same cause. Cut twigs made by the twig girdler, *Onsideres cingulatus* (Shay), were seen underneath many trees in the late summer. Infections were not observed in the younger orchards.

*Cephalosporium* wilt, caused by *Cephalosporium diospyri* Crandall, is widely distributed on the native *D. virginiana*. Transmission to tree injuries is random and slow. Vectors include the twig girdler and the powder post beetle *Xylobiops basilaris* (Shay). Since *D. kaki* and *D. lotus* are resistant their use as rootstocks would prevent infections, but little is known of their performance in Florida. Burning limbs cut by the twig girdler and cutting down and destroying infected trees in and near the orchard are recommended control measures (3).

Observations were made on the effects of leaf spot caused by *Cercospora diospyri* Thuem. on persimmons. Differences in cultivar resistance were only slight with defoliation starting in September and varying in intensity related to inoculum levels from previous years. Defoliation before fruit maturity interrupted the normal ripening process; it also affected sequential ripening. Further early defoliation limited the production of the next year's fruiting wood. When spring and summer fungicide applications were used problems with leaf spot were less severe.

Anthraxnose affected the fruit of many cultivars. It was most severe as a secondary pathogen gaining entry through openings in the fruit. Some of the astringent cultivars were subject to concentric growth ring cracking and anthracnose infections as ripening progressed. Anthracnose in the non-astringent cultivars was favored by distal end splitting, dehiscence from the calyx and stink bug probings.

Selection of cultivars that are not subject to cracking or openings will help in anthracnose prevention. Late season

insecticides will control stink bugs and may limit the insects responsible for the spreading of *Cephalosporium* wilt.

White peach scale, *Pseudaulacaspis pentagona* (Targioni), was sometimes a problem on trees where dormant oil was not used. Limb girdling and occasionally tree death occurred as a result of scale infestations.

**Freeze damage.** Cold injury often occurred during winters with severe freezing. Damage ranged from a few dead pockets in the trunk to major killing of tissue throughout the tree. When winter conditions produced minor trunk damage trees grafted high on *D. virginiana* were not affected. This may be attributed to the native stock being more adapted to alternating warm cold cycles and not as likely to initiate cambial activity as the *D. kaki*.

When winter conditions were severe enough to kill major portions of trees, damage could be related to a tree's physiological condition. Previous heavy cropping especially for more than one year, or poor growing conditions the previous seasons increased a trees chances for severe freeze damage. No cultivar resistance to freeze damage was observed. In general freeze damage could be lessened by choosing orchard locations with good air drainage (14).

**Biennial bearing.** All cultivars were prone to biennial bearing. Off-year fruiting was characterized by either sparse bloom or fruit drop during the fruit maturation period and directly related to heavy crop loads the previous year. Heavy cropping on many cultivars limited the production of new wood with strong buds from which the next season's flowering and fruiting would occur.

The first period of drop was in mid to late April. Abortive blooms and small fruit were observed underneath the trees possibly resulting from inadequate pollination, excessive flower production (7), or flower damage by thrips (3). Other drop periods occurred in the summer and fall up until harvest. Some fruit drop at these times was related to an abrupt increase in soil moisture since drop often occurred after a heavy rain interrupted a period of dry weather. In the irrigated orchard at Gainesville and other locations where soil moisture was consistent, fruit drop was less than in areas where moisture levels fluctuated.

When parthenocarpic and seeded fruit were set on a tree, 80 to 100% of the drop consisted of the parthenocarpic fruit. When no parthenocarpic fruit were present some seeded fruit would abort. However, cultivars were much less likely to drop fruit with well-formed seed.

Although heavy seed production increases biennial bearing (5), some seed may lessen fruit drop (1, 8). The number of seed is partially determined by a cultivars seed forming ability (3). Other factors that affect seed production are the distance from the pollen source (4), quantity of male flower production (4), and efficiency of pollination (7). Cultivars have degrees of ability to set and hold parthenocarpic fruit (1, 3). Those that are medium to highly parthenocarpic should be grown with fewer pollinators than those with a low degree of parthenocarpic.

Reducing the amount of crop load through fruit or flower thinning reduces biennial bearing (9). Thinning after petal drop of 'Tannenashi' produced 3 yr of consistent cropping. Control trees had about 1/3 more fruit than thinned trees in the first and third years but produced less than 7 fruit per tree in the second year. New wood production was more consistent for thinned trees. Limiting heavy crop loads may also lessen chances of freeze damage.

Dormant pruning to remove last year's fruiting wood increases yields (9, 10). This pruning method at the evaluation block was observed for 1 yr and no conclusions could be made. Affects of the light frequent fertilizations on excessive vegetative growth or fruit drop could also not be determined.

Older trees have a greater tendency towards annual bearing (8). Cultivars 6-to-10 yr old of 'Siajo' and 'Giombo' set crops only the first and third years, whereas 15- to 20-yr-old trees had annual crops with only small reductions in the off year. However, rejuvenation pruning and crown thinning may be necessary to maintain fruiting vigor in older trees (10).

Annual bearing affected tree shape. Vigorous cultivars in the cycle of biennial bearing when forced into annual bearing by thinning, pollination or consistent soil moisture levels had a more spreading canopy. Limb crotch angles were wide and general tree shape was desirable. Excessive, upright, vigorous, vegetative growth was nonexistent on older trees, but was common on younger trees of some cultivars.

Certain cultivars were more vigorous on *D. virginiana* than when on *D. lotus* or *D. kaki*. Fruit drop of some cultivars on *D. virginiana* or *D. lotus* may decrease on *D. kaki* (13), but not enough trees existed for comparisons.

**Fruit characteristics.** Color of persimmon fruit when soft ripe varied in degrees of yellow, orange or red and was specific for each cultivar. It was not practical to harvest fruit when soft, but necessary for the astringent types to develop softness after picking. Astringent cultivars with 70% of their final color formed would adequately soften and lose their astringency within 5 days.

Non-astringent types could be eaten either hard or soft as astringency existed only in the immature green or partially colored fruit. For attractiveness, picking was done when the green color was mostly replaced with a 90% yellow to orange color. For softening to occur within 5 to 7 days color was mostly orange or 20-30% orange-red depending on the cultivar.

A 10-day refrigeration period at 40-45°F retarded ripening. After removal, quality was not affected but a 2- to 3-day delay in softening occurred. Soluble solids ranged from 16-27% with a 21% average of all cultivars tested. Readings were taken in the soft ripe stage. Generally fruit quality of soft fruit was similar in most cultivars. Only small differences existed in the amount of liquid or gelatinous matter of the pulp.

Long term yields were not gathered but some observations were made. Fruit size varied with crop load, but generally cultivars could be classified as small (3.5-4.6 oz), medium (5.3-6.1 oz) or large (6.7-8.8 oz) fruited. Yields

ranged from 1/2 (20-30 lb.) to 3 bushels (120-210 lb.) for trees between 5 to 20 yr old.

Fruit ripened in the fall and was classified as early (September 1-20), mid (September 21-October) or late season (November-December). Vigorous or young trees of the early ripening cultivars would sometimes ripen fruit later than normal. Various climatic conditions could change a cultivar's ripening season. Further, as tree age increased harvest duration seemed to decrease and ripening seasons tended to be earlier.

Persimmons grow in all areas of the state. However, some astringent cultivars which bloom later than others and probably have a higher chilling requirement, do not perform well in the southern regions of the state.

**Cultivar characteristics.** The common astringent cultivars planted in Florida are listed in order of ripening season. Further information is included in Table 1. 'Siajo' is generally recognized as having the best eating fruit of these persimmons. Soluble solids range between 24-27%. The fruit are comparatively small in size. 'Giombo' ripens a few days after 'Siajo', and is almost as sweet. Fruit have a high jelly content and a thin peel. Young trees on *D. virginiana* tend to be vigorous and biennial bearing, while older trees are quite uniform. Yields of 1 to 2 1/2 bushels were seen on young and old trees, respectively. Two trees 'Korean' and 'Kengsun' or 'Kengsun-Ban-C' were similar in performance and probably the same cultivar. Trees were upright, vigorous and biennial. Performance was not impressive. Trees of 'Great Wall' were also vigorous and biennial. Performance may improve on *D. kaki*. Fruit were small, flat, 4-sided and attractive with thin black stripes radiating from the calyx. The pulp was drier than other cultivars. 'Tannenashi' is the most popular dooryard persimmon in Florida. A single tree may be planted since 'Tannenashi' is highly parthenocarpic. Fruit were large and conic in shape and harvest may be extended over a long period. Fruit quality was not as high as other cultivars but the flesh was drier than most. The fruit are sometimes marketed locally. Crop loads are biennially heavy with a limitation of new wood formation and tree growth during heavy bearing years. 'Yamato Hyakume' has a good red coloration and often heavy crops of large fruits. Concentric growth ring cracking can occur when the fruits are large. Although it is pollination variant only a small amount of dark tannin tissue will be present when few seeds are in the

Table 1. Characteristics of astringent persimmon cultivars.

Cultivar	Fruit color <sup>z</sup>	Fruit size	Fruit shape <sup>y</sup>	Fruit cracking	Pollination type <sup>x</sup>	Degree of parthenocarp	Ripening season	Length of season (wk)	Tree vigor <sup>w</sup>	Area of adaptation <sup>v</sup>
Aizumishirazu	O	S-M	R	no	PC	—	Mid	4	med	—
Costata	O	M-L	R-C	—	PC	—	Mid	—	—	All
Eureka	OR	M-L	C	no	PV	High	Mid	4	med	All
Gailey	R	S	C	yes	PV	Low	Mid	8	high	All
Giombo	O	M-L	OC	no	PC	High	Early	3	high	All
Great Wall	OR	S	F	no	PC	Low	E-M	3-4	high	C&N
Hachiya	R	M-L	OC	yes	PC	High	Mid	4	med	All
Hiratanenashi	O	M	F	no	PC	High	E-M	6	med	C&N
Korean	R	M	F	no	PC	Med	E-M	3	high	C&N
Ormond	R	S	C	—	—	—	Late	8	—	—
Sheng	O	M-L	F	no	PC	Low	Mid	3-4	med	C&N
Siajo	Y-O	S	C	no	PC	High	E-M	3-4	high	All
Tamopan	O	M-L	F	no	PC	High	Mid	3-5	high	—
Tanenashi	O-OR	M-L	OC	no	PC	High	E-M	7	low	All
Triumph	R	M-L	F	no	—	—	—	—	—	All
Yamoto Hycume	R	M-L	C	yes	PV	High	E-M	7	med	All

<sup>z</sup>Final dominant color of fruit when soft ripe. Y = yellow, O = orange, OR = orange red, R = red.

<sup>y</sup>Fruit shape is R = round, F = flat (oblate), FC = flat conic (flat but pointed on the distal end), C = conic, and O = oblong.

<sup>x</sup>PC = pollination constant, PV = pollination variant.

<sup>w</sup>Young tree vigor on *Diospyrus virginiana* rootstock with adequate pollination.

<sup>v</sup>All = all areas of Florida, C = central Florida, N = north Florida.

Table 2. Characteristics of non-astringent persimmon cultivars.

Cultivar	Fruit color <sup>z</sup>	Fruit size	Fruit shape <sup>y</sup>	Distal end splits	Calyx dehiscence tendency	Pollination type <sup>x</sup>	Degree of parthenocarpy	Tree vigor <sup>w</sup>	Ripening season	Length of season (wk)	Area of adaptation <sup>v</sup>
Fuyu 26772	R	M-L	F	Low	Small	PC	Med	Med	M-L	8	All
Fuyu 72663	R	M-L	F-FC	Med	Small	PC	Med	Med	M-L	8	All
Ichikikeijiro	OR	M-L	F	Low	Small	PC	Med	Low	Mid	4	All
Jiro	R	M-L	F	Med	Med	PC	Med	Med	Mid	5	All
Hanafuyu	OR	L	F	High	Med	PC	Med	Low	M-L	4	All
Hanagoshu	R	M-L	FC	Low	Med	PC	Med	High	Mid	6	All
Shogatsu	R	M-L	FC	Low	Small	PV	Med	High	Mid	5	All

<sup>z</sup>Final dominant color of fruit when soft ripe. Y = yellow, O = orange, OR = orange red, R = red.

<sup>y</sup>Fruit shape is R = round, F = flat (oblate), FC = flat conic (flat but pointed on the distal end), C = conic, and O = oblong.

<sup>x</sup>PC = pollination constant, PV = pollination variant.

<sup>w</sup>Young tree vigor on *Diospyros virginiana* rootstock with adequate pollination.

<sup>v</sup>All = all areas of Florida, C = central Florida, N = north Florida.

fruit. Tree growth and annual fruit setting ability were good under limited pollination and when on *D. virginiana* rootstock. 'Hachiya' is noted for fruit shape, size and red color. Young trees tended towards biennial bearing and heavy fruit drop on *D. virginiana*. Annual bearing and crop load may be improved on *D. kaki* (14). Fruit of 'Hirattannashi' have a long shelf life due to a thick skin but astringency is sometimes not removed through softening. Tree shape and performance on *D. virginiana* rootstock was good. 'Eureka' has large bright orange-red fruit. The shape is flat-roundish and tucked in at the calyx. It is pollination variant but dark flesh is slight when seed set is low. Under heavy crop loads new wood production was light. 'Sheng' is a favorite fruit of many persimmon enthusiasts. The fruit was large and unusually attractive as the shape is ribbed and tucked in at the calyx. Pollination was necessary for good fruit set and under these conditions annual cropping was consistent and tree shape was excellent. 'Tamopan' has an unusual indentation around the top 1/3 of the fruit. Color is usually deep orange with brown specks on the skin. The peel is thick and the pulp is juicy. Trees are slow to come into production. 'Gailey' has long been the standard pollinizer due to the yearly abundance of male blooms. Fruit color is dull and the flesh is mostly dark regardless of the number of seeds set.

Non-astringent cultivars are listed in the order of the ripening season and in Table 2. 'Ichikikeijiro' is the earliest ripening non-astringent cultivar tested. Trees are not vigorous, even when propagated on *D. virginiana*. 'Jiro' is similar to its bud sport 'Ichikikeijiro' although tree growth is more vigorous and red color development is higher. 'Fuyu' is the most popular non-astringent persimmon in Florida. Overall it was the best cultivar with quality, consistent cropping, and tree shape all receiving high ratings. At least 4 different importations were made under the original name 'Fuyugaki'. Two were examined. A flat type with small noticeable dark streaks throughout the flesh was probably the original P.I. 26773 cultivar. It had the least distal end cracking and was judged to be the best. The other was more round and could possibly have been P.I. 72662. Tree performance on *D. virginiana* was excellent with fairly consistent yearly cropping and good tree shape. Light male flowering sometimes occurs on 'Fuyu'. 'Hanafuyu' is a late mid-season type ripening after 'Fuyu'. Consistent cropping with large fruit was observed. Growth was not vigorous, the trees were small and yields were low. 'Shogatsu' has a flattened shape and is semi-conic at the distal end. It is annually staminate flowered and has a moderate amount of male flower production. Fruit quality is fair. Old trees examined were large and over 30 ft tall. 'Hanagoshu' is similar to 'Shogatsu'. The tree was more upright and male flowering was not as heavy. It is not known if 'Hanagoshu'

consistently produces male blooms. Fruit of 'Hanagoshu' were excellent but were late to lose astringency.

### Conclusions

Consistent cropping, large fruit size, high fruit quality and favorable tree growth and shape are important characteristics of persimmon cultivars. The most promising astringent cultivars are 'Giombo', 'Tanenashi', 'Eureka' and 'Sheng'. 'Yamato Hyacume' and 'Hachiya' ripen with 'Eureka' and 'Sheng' and have much better red coloration though cracking from concentric growth rings can be a problem. The most promising non-astringent cultivars for sequential ripening are 'Ichikikeijiro', 'Jiro' and 'Fuyu'.

Although only a very limited commercial market has been developed for persimmons in Florida, there is room for expansion. Fruit are popular with orientals and are generally increasing in popularity. Small crops with varying yields and quality are easy to obtain. However, for commercial success, orchard location, cultivar selection and a variety of horticultural methods, including fruit thinning and tree irrigation, to improve annual bearing and tree life should be considered.

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## CONTROL OF MANGO ANTHRACNOSE WITH FOLIAR SPRAYS

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**Abstract.** Benomyl and thiophanate methyl at 1.8 g/liter were significantly more effective than captafol, mancozeb, and vinclozolin at 1.8 g/liter and tribasic copper sulfate at 3.6 g/liter as foliar sprays for the control of anthracnose (*Colletotrichum gloeosporioides* Penz.) on mango (*Mangifera indica* L.). Captafol, mancozeb and vinclozolin were significantly better than tribasic copper sulfate and the control. Percentage of disease-free fruit for the benomyl and thiophanate methyl treatments was greater than 85. The % disease-free fruit for captafol, mancozeb, and vinclozolin treatments was greater than 70 with tribasic copper sulfate yielding only 18% disease-free fruit. No toxicity was noted on the leaves, flowers or fruit for any of the chemicals tested.

The mango is a highly prized fruit in Florida and the tropical countries throughout the world. Dade county Florida is the major production area in the state with about 87% of the total mango acreage. The commercial mango acreage increased from 1,746 in 1980 to 2,228 in 1982 (4).

Mango anthracnose caused by *Colletotrichum gloeosporioides* Penz. is a very serious problem, more so than any other disease that affects tropical fruit crops in Florida. To produce commercial market quality fruit, chemicals such as benomyl, copper and mancozeb have been sprayed weekly on the flowers and at 2 to 3 week intervals on fruit until harvest (3, 7, 8, 12, 13, 14, 15).

The purpose of this research was to evaluate thiophanate methyl (Topsin), vinclozolin (Ronilan) and captafol (Difolatan 80 Sprills) for the control of mango anthracnose.

### Materials and Methods

The spray test was carried out with 'Irwin' mango which is highly susceptible to anthracnose. Single tree plots were replicated 5 times.

The fungicides tested were benomyl (Benlate) at 1.8 g/liter, thiophanate methyl (Topsin) at 1.8 g/liter, Captafol (Difolatan 80 Sprills) at 1.8 g/liter, mancozeb (Dithane M45) at 1.8 g/liter, vinclozolin (Ronilan) at 1.8 g/liter, and tribasic copper sulfate at 3.6 g/liter. All fungicides were used in combination with the sticker-extender di-1-p-menthene (Nu-Film-17) at 0.3 ml/liter. The chemicals were applied as a dilute spray at 3800 liters/ha. The sprays were applied with a Meyer speed sprayer operated at 21.09 kg/

cm<sup>2</sup>. Applications were started in February when panicles were 25 mm long and applied weekly until fruit set after which benomyl and thiophanate methyl were applied to fruit every 14 days until 14 days prior to harvest. Mancozeb, captafol, vinclozolin, and tribasic copper sulfate were also applied weekly until 14 days before harvest. Fruits were harvested in June and rated as anthracnose free, with mild, or with severe infection. Commercial production practices were followed throughout the experiment.

### Results

All fungicides on fruit reduced the incidence of anthracnose significantly compared with the control (Table 1). Benomyl and thiophanate methyl gave 89% disease-free fruit while captafol, mancozeb, vinclozolin, tribasic copper and the control gave 73, 76, 76, 18, and 0% disease free fruit, respectively (Table 1). Captafol, vinclozolin, and mancozeb-treated fruit had significantly less disease than tribasic copper and control for % disease-free fruit (Table 1). Benomyl, thiophanate methyl and the control had 6.8, 7.4 and 5.0% fruit with mild anthracnose, respectively, whereas all other treatments had significantly higher percentages of fruit with mild anthracnose. Tribasic copper and the control had a significantly higher percentage of fruit with severe anthracnose, 58 and 97% respectively, than any of the other fungicides. Benomyl and thiophanate methyl provided significantly less fruit with severe anthracnose than captafol, mancozeb or vinclozolin.

Table 1. Effect of fungicides on incidence of anthracnose on fruit of 'Irwin' mango.

Treatment	Rate (g/liter)	Fruit (%)		
		Disease free	Mild anthracnose	Severe anthracnose
Benomyl	1.8	89.2 az	6.8 a	4.0 a
Thiophanate methyl	1.8	88.9 a	7.4 a	3.6 a
Captafol	1.8	72.7 b	19.3 b	8.1 b
Mancozeb	1.8	75.8 b	18.0 b	7.2 b
Vinclozolin	1.8	75.9 b	17.7 b	7.4 b
Tribasic copper	3.6	18.0 c	23.8 c	58.3 c
Control	—	0.0 d	5.0 a	96.9 d

<sup>z</sup>Mean separation in columns by Duncan's multiple range test, 5% level.

Benomyl, thiophanate methyl, captafol, mancozeb and vinclozolin provided better than 90% marketable fruit while copper and the control only yielded 41.9 and 5.2%, respectively (Table 2).

Toxicity was not noted with any of the fungicides tested on the foliage, flowers, or fruit.

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