

# Performance of Apple and Pear Cultivars in Northern Mississippi, 1987-1994

*Frank B. Matta and Elizabeth Montgomery*

## INTRODUCTION

---

Apple and pear cultivars worthy to place in Mississippi orchards were listed by the Mississippi Agricultural Experiment Station in 1911 (McKay 1911). Most of these recommended cultivars have been replaced by new cultivars. Thompson (1911) presented general cultural practices for apples and pears in Mississippi, but he did not present performance data. Thompson recognized the importance of diversification and recommended that apples and pears be grown in Mississippi. Ragland and Overcash (1947) reported on cultivars for home orchards and local markets. However, no performance data were presented. The researchers acknowledged that Mississippi could be a commercial apple- and pear-growing

state if improved cultivars adapted to Mississippi's climatic conditions could be developed.

In recent years, new more desirable apple and pear cultivars have been developed, and renewed interest in apple and pear production in Mississippi has prompted potential growers to seek information on adapted cultivars.

An apple and pear orchard was established at the Pontotoc Ridge-Flatwoods Branch Experiment Station in 1987 to evaluate the performance of several apple and pear cultivars. This research report presents results of apple and pear cultivars evaluated from 1987 to 1994.

---

Frank Matta is a professor and Elizabeth Montgomery is a research assistant in the Department of Plant and Soil Sciences at Mississippi State University. For more information, contact Dr. Matta at (662) 325-7716. Research Report 22:12 was published by the Office of Agricultural Communications, a unit of the MSU Division of Agriculture, Forestry, and Veterinary Medicine. It was edited by Robert A. Hearn, publications editor, and designed by Gina Daly, graphic design assistant.



**Experiment Station**  
Vance H. Watson, Director

**Mississippi Agricultural & Forestry Experiment Station**  
Malcolm A. Portera, President • Mississippi State University • J. Charles Lee, Vice President

## MATERIALS AND METHODS

A total of five apple and four pear cultivars were evaluated. Trees were planted in the spring of 1987 and spaced 16 by 20 feet in a randomized complete block design, with four replications and a single tree per replicate. Trees were trained to the modified central leader system. The sod strip method of culture was maintained using herbicides under tree rows (12-foot band) and a mowed grass strip between rows. Water was applied as needed with a drip irrigation system. Rootstock for the apple cultivars was MM111. Pear cultivars were grown on *Pyrus calleryana* rootstock.

In the first two seasons, fertilizer was applied at the rate of 1.98 pounds of 0-20-0 and 1.98 pounds of 35-0-0 per tree. In subsequent seasons, 13-13-13 was

applied at a rate of 0.25 pound of nitrogen per inch of trunk diameter. Time of fertilizer application was early spring (approximately 3 weeks before bud break). The fertilizer was broadcast around the drip line of each tree. The soil was an Atwood silt loam.

Insects and disease were controlled each growing season with various insecticides and fungicides following current recommended spray schedules provided by the Mississippi State University Extension Service. Streptomycin was applied each year during bloom at the rate of 12 ounces per acre to control fire blight.

Measurements of yield in pounds per tree, harvest date, and fire blight susceptibility were made each year from 1990 to 1994.

## RESULTS

### Apple Cultivars

Table 1 presents total and annual yields per tree of each cultivar. First-year harvest yields indicated that 'Yellow Delicious' produced more than the other cultivars. In 1991, 'Red Chief CS' outproduced the other cultivars. Most cultivars were equally productive in the third year; the exception was 'Paula Red,' which was the lowest yielding cultivar. First significant production for all cultivars occurred in 1992, after four growing seasons. In 1993, 'Sundale Golden Delicious' and 'Yellow Delicious' produced the highest yields, followed by 'Red Chief MS' and 'Red Chief CS.' The lowest producer was 'Paula Red.' In 1994, yields of all cultivars were low due to biennial bearing and a late-spring frost that damaged

floral buds. However, 'Red Chief CS,' 'Red Chief MS,' and 'Sundale Golden Delicious' were equally productive. 'Yellow Delicious' and 'Paula Red' had low yields.

Average yield for the 4-year period ranged from 12.6 to 38.9 pounds per tree. Such yields are above the 4-year average reported in New Mexico, where the range was 5.1 to 13.5 pounds per tree (Matta et al. 1980). In Washington State, cumulative yield to year 5 ranged from 37.4 to 72.6 pounds per tree; cumulative yield to year 9 ranged from 165 to 277.2 pounds per tree (Barritt et al. 1996). Cumulative yield per tree generally increased as tree size increased. In Ohio, 'Rome Beauty' strains produced 103.6 pounds per tree cumulative for 4 years to 171.6

**Table 1. Fruit yield of five apple cultivars grown at Pontotoc Ridge-Flatwoods Branch Experiment Station, 1990-1994.**

Cultivar	Yield (pounds per tree) <sup>1</sup>						
	1990	1991	1992	1993	4-year avg.	1994	Total
Yellow Delicious	18.6 a	1.4 b	63.4 a	99.2 a	37.4	4.6 b	187.2
Red Chief CS	14.2 b	5.3 a	70.2 a	43.1 bc	34.0	37.4 a	170.2
Red Chief MS	12.0 bc	2.9 b	88.8 a	55.7 b	37.7	29.5 a	188.9
Sundale Golden Delicious	11.5 bc	2.2 b	56.6 a	113.5 a	38.9	10.8 a	194.6
Paula Red	2.7 bc	— <sup>2</sup>	10.5 b	24.4 c	12.6	5.9 b	50.5

<sup>1</sup>Means in columns separated by Duncan's Multiple Range test, 5% level. Means with the same letter do not differ.

<sup>2</sup>Paula Red had premature drop so no data available.

pounds per tree (Ferree 1994). The cumulative yield for 4 years in this study ranged from 166.8 to 222.8 pounds per tree. Therefore, it is concluded that apple yields in this study are within the normal range of production compared to New Mexico, Washington, and Ohio.

Harvest date varied depending on year. In the first 3 years, all cultivars were harvested in late August. In the last 2 years of the study, all cultivars were harvested in September. It was noted that 'Paula Red' matured fruit earlier than the remaining cultivars (late June to late July) (Table 2).

**Table 2. Harvest dates for apple cultivars planted at Pontotoc Ridge-Flatwoods Branch Experiment Station, 1990-1994.**

Cultivar	Harvest date by year				
	1990	1991	1992	1993	1994
Yellow Delicious	8/31	8/22	8/26	9/6	9/29
Red Chief CS	8/31	8/22	8/26	9/6	9/29
Red Chief MS	8/31	8/22	8/26	9/6	9/29
Sundale Golden Delicious	8/15-8/31	8/22	8/26	9/6	9/29
Paula Red	8/1-8/6	– <sup>1</sup>	7/30	7/28	7/21

<sup>1</sup>Paula Red had premature drop so no data available.

Table 3 presents fire blight susceptibility and percentage of trees infected. The 'Red Chief' strains were less susceptible to fire blight, followed by 'Yellow Delicious' and 'Sundale Golden Delicious.' 'Compact Red Delicious' exhibited less susceptibility to fire blight in Mississippi when evaluated by the van der Zwet system (Sloan et al. 1996). Such resistance was also apparent by the low number of 'Red Chief' trees infected compared with the remaining cultivars, which had at least 75% of trees infected.

**Table 3. Fire blight susceptibility of the various apple cultivars grown at the Pontotoc Ridge-Flatwoods Branch Experiment Station, 1990-1994.<sup>1</sup>**

Cultivar	Fire blight susceptibility <sup>2</sup>	Percentage of trees infected
Yellow Delicious	1.5 b	75 b
Red Chief CS	0.1 a	8 a
Red Chief MS	0.2 a	17 a
Sundale Golden Delicious	1.8 b	75 b
Paula Red	3.3 c	75 b

<sup>1</sup>Means in columns separated by Duncan's multiple range test, 5% probability. Means with the same letter do not differ significantly.

<sup>2</sup>Rating 0-10: 0 = no susceptibility, 10 = very susceptible. Values represent a 4-year average (1990-1994).

## Pear Cultivars

Table 4 presents total and annual yields per tree for each cultivar. The first significant production occurred in 1990, when 'Orient' and 'Keiffer' out-produced 'LeConte' and 'Moon-Glo.' In 1991, 'LeConte' outyielded the remaining cultivars. However, in 1992, 'Orient' was the highest producer, followed by 'Keiffer' and 'LeConte.' 'Moon-Glo' trees were killed by fire blight. In 1993, 'Orient' and 'Keiffer' outyielded 'LeConte.'

Harvest dates for all pear cultivars were the same for a given year, but the dates did vary by year. Harvest date ranged from August 23 in 1991 to August 31 in 1990 and 1993 (Table 5).

Full bloom ranged from March 5 to March 29, depending on year and cultivar. The cultivars bloomed early and were very susceptible to late-spring freezes, which generally occurred in March (Table 6).

Table 7 presents fire blight susceptibility of the various cultivars. 'Moon-Glo' was highly susceptible, and all trees were killed by fire blight in 1992, 5 years after transplanting. The remaining cultivars were equally susceptible. However, 'Keiffer' and 'LeConte' had a lower percentage of infected trees.

'Orient' was released by the University of Tennessee Agricultural Experiment Station in 1945 and was described as resistant to fire blight. Although the parentage of 'Orient' is unknown, it probably originated from a cross of a European cultivar and a cultivar from China (Deyton and Cummins 1991). Lipe et al. (1991) described 'Keiffer' as an Oriental hybrid of high fire blight resistance recommended in Texas. In this study, 'Orient,' 'Keiffer,' and 'LeConte' were slightly susceptible to fire blight.

Average yield in the first 4 years ranged from 41.6 to 54.5 pounds with an average of 54.5 pounds for the cultivars in this study. European pear 'Anjou' was reported to produce between 4.4 and 86.9 pounds the first 4 years of production with an average of 48.8 pounds (Denby et al. 1988).

**Table 4. Fruit yield of four pear cultivars grown at Pontotoc Ridge-Flatwoods Branch Experiment Station, 1990-1993.**

Cultivar	Yield (pounds per tree) <sup>1</sup>					Total
	1990	1991	1992	1993	4-year avg.	
Orient	9.8 a	4.1 b	9.9 a	194.3 a	54.5	218.1
Keiffer	7.5 a	4.5 b	5.7 b	184.1 a	50.4	201.8
LeConte	2.5 b	9.5 a	5.3 b	149.2 b	41.6	166.5
Moon-Glo	0.36 b	0.2 c	– <sup>2</sup>	–	–	–

<sup>1</sup>Means in columns separated by Duncan's multiple range test, 5% probability. Means with the same letter do not differ significantly.  
<sup>2</sup>Trees killed by fire blight.

**Table 5. Harvest data of four pear cultivars grown at Pontotoc Ridge-Flatwoods Branch Experiment Station, 1990-1993.**

Cultivars	Harvest date by year			
	1990	1991	1992	1993
Orient	8/31	8/23	8/26	8/31
Keiffer	8/31	8/23	8/26	8/31
LeConte	8/31	8/23	8/26	8/31
Moon-Glo	8/31	8/23	– <sup>1</sup>	–

<sup>1</sup>Trees killed by fire blight.

**Table 6. Full bloom date of four pear cultivars grown at the Pontotoc Ridge-Flatwoods Branch Experiment Station, 1990-1993.**

Cultivars	Full bloom date by year			
	1990	1991	1992	1993
Orient	3/7	3/27	3/5	3/22
Keiffer	3/8	3/29	3/10	3/26
LeConte	3/10	3/27	3/20	3/22
Moon-Glo	3/12	3/27	– <sup>1</sup>	–

<sup>1</sup>Trees killed by fire blight.

**Table 7. Susceptibility to fire blight of pear cultivars at Pontotoc Ridge-Flatwoods Branch Experiment Station.<sup>1</sup>**

Cultivar	Fire blight susceptibility <sup>2</sup>	Percentage of trees infected
Orient	0.8 a	33 b
Leiffer	1.1 a	17 a
LeConte	0.3 a	25 ab
Moon-Glo <sup>3</sup>	7.5	100 c

<sup>1</sup>Means in columns separated by Duncan's multiple range test, 5% probability. Means with the same letter do not differ.  
<sup>2</sup>Rating 1-10: 1 = slightly susceptible, 10 = very susceptible.  
<sup>3</sup>Moon-Glo cultivar trees were killed by fire blight in 1992.

## CONCLUSION

Results illustrate bloom period, harvest date, yield, and fire blight susceptibility of apple and pear cultivars in northern Mississippi. Based on cumulative yields for 4 years, it is concluded that apple and pear yields are within the normal range of production. Apple cultivars 'Red Chief CS' (Campbell Strain) and 'Red Chief MS' (Mercier Strain) are recommended for Mississippi based on yield and tolerance to fire blight.

Pears, as indicated by bloom period, were very susceptible to late-spring freezes. 'Moon-Glo' pear is

not recommended for Mississippi due to its susceptibility to fire blight. 'Orient,' 'Keiffer,' and 'LeConte' are recommended based on yield and tolerance to fire blight.

Continued research is needed to compare additional apple and pear cultivars under Mississippi conditions. In addition, long-term production and fruit tree longevity must be evaluated. Furthermore, the extent of crop loss due to late-spring freezes must be determined.

## ACKNOWLEDGMENTS

---

Appreciation is extended to all the technical staff, support staff, and graduate students for their valuable contribution to this research. Special thanks are extended to those who made this research possi-

ble at the Pontotoc Ridge-Flatwoods Branch Experiment Station and to Dr. Patrick D. Gerard, assistant professor/statistician, for his review of the manuscript for statistical accuracy.

## REFERENCES

---

- Barritt, B.H., B.S. Konishi, and M.A. Dilley.** 1996. Performance of three apple cultivars with 18 vigorous rootstocks during nine seasons in Washington. *Fruit Varieties J.* 50(2):88-98.
- Denby, L.G., M. Meheriuk, and R. Brownlee.** 1988. Effect of training systems on precocity and yield in 'Anjou' pears. *Fruit Varieties J.* 62(2):65-67.
- Deyton, D.E., and J.C. Cummins.** 1991. History of pear breeding in Tennessee. *Fruit Varieties J.* 45(3):143-146.
- Ferre, D.C.** 1994. Performance of eight strains of 'Rome Beauty' over nine years 1994. *Fruit Varieties J.* 48(4):240-244.
- Lipe, A.J., C. Lyons, and L. Steins.** 1991. Home fruit production-pears. Texas Agricultural Extension Service Publication B1598. Texas A&M University System, College Station, TX.
- Matta, F.B., R.F. Hooks, D.T. Sullivan, and P.M. Trujillo.** 1980. Evaluation of apple cultivars on size-controlling rootstocks. New Mexico State University. Research Report No. 428.
- McKay, A.B.** 1911. Suggestions for growing home fruits. Mississippi Agricultural Experiment Station Bulletin No. 146.
- Ragland, C.H., and J.P. Overcash.** 1947. Orchard and small fruit culture in Mississippi. Mississippi Agricultural Experiment Station Bulletin No. 450.
- Sloan, R.C., Jr., F.B. Matta, and F.J. Killebrew.** 1996. Effect of cultivars and foliar nutrients on fire blight susceptibility in apple. Mississippi Agricultural and Forestry Experiment Station Research Report Volume 21, No. 7.
- Thompson, H.C.** 1911. Apple growing in Mississippi. Mississippi Agricultural Experiment Station Bulletin No. 147.

# Mississippi State UNIVERSITY



Printed on Recycled Paper

Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the Mississippi Agricultural and Forestry Experiment Station and does not imply its approval to the exclusion of other products that also may be suitable.

Mississippi State University does not discriminate on the basis of race, color, religion, national origin, sex, age, disability, or veteran status.