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# Performances of Introduced Peach and Nectarine Varieties in Thailand

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## ABSTRACT

Performance of sixteen peach and six nectarine varieties were studied in the highlands of Thailand for 5 years ( 1982 - 1987 ) at the Royal Ang Khang Station. Among the peach varieties, EarliGrande gave the highest yield of 18.6 kg/tree, while Fla 5 - 4 produced only 1.8 kg/tree, the lowest. Florda King and Fla 5 - 18 were the two varieties with large fruits ( > 140 gm ). Flordared and Flordasun yielded the small sized fruits ( < 70 gm ). The highest fruit firmness at harvest was found in the Fla 5 - 4 with 16.05 kg/cm$^2$, while Swellen Grabriel gave the lowest figure of 7.14 kg/cm$^2$. The percent total soluble solids of the fruits at harvest was in the range of 9.2 - 10.6° Brix and was not significantly different among the varieties studied.

In nectarine, the biggest fruit of 90.9 gm was found with Fla 5 - 14 and this variety also produced the highest yield of 13.6 kg/tree. The smallest fruit was found with the Sun Red variety, 44.8 gm. Fla 5 - 8 gave the highest fruit firmness at harvest ( 13.72 kg/cm$^2$ ) whereas Sundowner gave the lowest figure ( 8.39 kg/cm$^2$ ). The percent total soluble solids of the fruits at harvest was in the range of 10.6 - 13.3° Brix and was not significantly different among the varieties.

Varieties recommended for commercial production by hilltribe farmers are the EarliGrande peaches and the Fla 5 - 14, and Sundowner nectarines. The fruit characters of these introduced varieties are discussed in relation to those reported from other countries.

## INTRODUCTION

Although Thailand is classified as a tropical country, it in fact experiences a range of climates varying from humid tropics in the South and Coastal regions to subtropics of the North and temperate climates in the high altitude areas.

Efforts to produce temperate deciduous fruits in the highland areas of Northern Thailand started in 1973 with the introduction of many varieties of deciduous fruits from various countries by the Royal Project ( Subhadrabandhu and Punsri, 1987 ). Such introductions aimed at identifying suitable varieties that can be commercially produced in the highlands. Research has been conducted to study the performance of these introduced varieties ( Punsri *et al.*, 1976; Subhadrabandhu, 1973, 1981, 1987 ).

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In the highlands of Northern Thailand, peaches have been grown by hilltribes for many centuries. It is believed that the trees were brought in by villagers migrating from mainland China ( Subhadrabandhu, 1973 ). Over many centuries, peach trees adapted to the growing conditions in the hills by the process of natural selections, resulting in a variety known as local peach. However, these peaches produce small, low quality fruits. Thus many peach cultivars of better quality have been introduced for testing performance in the Northern highland areas using these local peaches as rootstocks. Among the stone fruits that can be grown in the highlands of Northern Thailand, low - chilling peach and nectarine seem to produce good crops and have good prospect for production by hilltribe farmers. In Thailand, fresh fruits of peach and nectarine are in good demand in the local market. If the quality of the locally produced peach and nectarine fruits can be improved, high income returns should be made by growers. In this paper we describe the fruiting performance and quality of sixteen peach and six nectarine varieties grown by the Royal Project in the highlands of north to develop recommendations for hilltribe farmers.

## MATERIAL AND METHODS

Sixteen low chilling peach and six nectarine varieties were introduced and tested for the performances at the Royal Ang Khang Station. The eleven varieties introduced from Dr. W.B. Sherman, Fruit Crops Department, University of Florida, Gainesville, were; EarliGrande, Flordabelle, Flordared, Flordasun, Florda King, Maravilha, San Pedro, Tropic Sweet, Fla 2 - 4, Fla 5 - 4 and Fla 5 - 18. Four peach varieties brought from the University of Hawaii were P - 49, P - 101, P - 105 and P - 112. One peach variety, Swellen Grabriel was received from Israel. The six nectarine varieties were Fla 3 - 4, Fla 5 - 13, Fla 5 - 14, Sunlite, Sundowner and Sunred. All of these nectarine varieties came from the Fruit Crops Department, University of Florida.

The peach and nectarine varieties were introduced in the form of bud sticks and grafted onto the local peach seedling rootstocks.

Four replicates eight year old plants of each variety were sampled. At harvest, twenty - five fruits from each variety were studied for fruit characters. The parameters measured were fruit weight, fruit length and width as well as the yield per tree. The stoneness character and the chilling requirement were observed. The latter character was calculated by comparing the first blooming date with that of a known chill - unit variety i.e. Sunred nectarine ( Sherman, pers.com. ). The juice of each fruit was analyzed for percent total soluble solids, using a hand sugar refractometer, and for acidity content ( mg of malic acid ) determined by titration with 0.009 N NaOH. Fruit firmness was measured using pressure tester ( Effigi type with a plunger diameter of 1.1 cm ).

Data averaged from 5 consecutive years ( 1982 - 1987 ) were analysed in a completely randomized design.

## RESULTS AND DISCUSSION

The data on the fruit weight and quality of introduced peach and nectarine varieties were averaged from data measured over five consecutive years ( Tables 1 and 2 ). Data on fruit characters of some peach varieties reported here ( Table 1 ) were similar to those reported earlier ( Subhadrabandhu, 1987 ) which indicated low temperature effects on these varieties when grown at Ang Khang in the highlands.

Fla 5 - 18 had the heaviest fruit ( 145.5 g ) while the lightest fruit was Flordasun ( 45 g/fruit ). The order of fruit size was in the same category as reported by our earlier work ( Subhadrabandhu, 1987 ). Among the introduced peach varieties, Flordasun fruit was always smallest, eventhough in other respects this variety is well

**Table 1 Fruit characters of peach varieties in Thailand.[1]**

| Variety | Weight per fruit ( g ) | Fruit width ( cm ) | Fruit length ( cm ) | Fruit firmness at harvest ( kg/cm$^2$ ) | % Total acid | TSS ( °Brix ) |
|---|---|---|---|---|---|---|
| EarliGrande | 108.06 | 6.04 | 6.04 | 10.14 | 0.70 | 9.73 |
| Flordabelle | 78.08 | 5.42 | 5.27 | 12.88 | 1.14 | 9.71 |
| Flordared | 67.75 | 5.30 | 5.91 | 9.00 | 1.28 | 10.48 |
| Flordasun | 45.00 | 4.56 | 5.54 | 8.85 | 0.81 | 9.97 |
| Flordaking | 140.71 | 6.64 | 6.64 | 8.92 | 0.77 | 9.17 |
| Maravilha | 78.08 | 5.42 | 5.27 | 9.75 | 1.14 | 9.71 |
| San Pedro | 90.83 | 5.66 | 5.82 | 11.76 | 0.96 | 9.39 |
| Swellen Grabriel | 81.79 | 5.41 | 5.11 | 7.14 | 0.99 | 9.00 |
| Tropic sweet | 79.79 | 5.09 | 5.30 | 11.41 | 1.19 | 10.00 |
| Fla 2 - 4 | 109.83 | 5.90 | 5.96 | 11.84 | 1.17 | 10.09 |
| Fla 5 - 4 | 81.71 | 5.07 | 6.59 | 16.05 | 0.83 | 10.16 |
| Fla 5 - 18 | 145.54 | 6.55 | 6.54 | 10.51 | 0.92 | 9.94 |
| P 49 | 133.13 | 6.54 | 6.01 | 11.52 | 1.24 | 10.32 |
| P 101 | 133.54 | 6.37 | 6.08 | 13.79 | 1.38 | 10.35 |
| P 105 | 106.46 | 5.77 | 5.70 | 12.42 | 1.29 | 10.45 |
| P 112 | 90.88 | 5.42 | 5.46 | 12.41 | 1.29 | 10.50 |

[1] Based on the performance at the Royal Ang Khang Station. Data averaged from 1982 - 1987

**Table 2 Fruit characters of nectarine varieties in Thailand.[1]**

| Variety | Weight per fruit ( g ) | Fruit width ( cm ) | Fruit length ( cm ) | Fruit firmness at harvest ( kg/cm$^2$ ) | % Total acid | TSS ( °Brix ) |
|---|---|---|---|---|---|---|
| Fla 3 - 4 | 69.08 | 5.06 | 4.99 | 11.80 | 1.36 | 13.32 |
| Fla 5 - 13 | 86.08 | 5.45 | 5.53 | 13.72 | 1.63 | 11.63 |
| Fla 5 - 14 | 90.86 | 5.47 | 5.69 | 12.91 | 1.37 | 10.62 |
| Sunlite | 104.21 | 6.03 | 5.83 | 13.50 | 0.75 | 8.03 |
| Sundowner | 60.54 | 4.75 | 4.85 | 8.39 | 1.91 | 11.70 |
| Sunred | 44.78 | 4.52 | 4.48 | 13.34 | 1.48 | 13.34 |

[1] Based on the performance at the Royal Ang Khang Station. Data averaged from 1982 - 1987

adapted to many subtropical growing areas. Under the rain-fed growing conditions of Northern Thailand, the size of Flordasun fruit was even smaller than that of local peach varieties ( Subhadrabandhu, 1981 ). Many of the introduced peach varieties responsed very well to irrigation especially during fruit development phase.

In the Thai market, one of the most important factors determining quality of peach fruit is fruit size. Among the introduced varieties, those classified as large sized fruits are Fla 5 - 18, P 49, P 101 and Florda King; medium sized fruits are EarliGrande, Flordabelle, San Pedro, Fla 2 - 4, P 105, P 112; and small sized fruits are Flordared, Flordasun, Maravilha, Swellen Grabriel, Tropic Sweet and Fla 5 - 4. Market preferences for peaches vary among countries and depends largely on the culture and eating habits of the people. Asians prefer peaches which have a juicy flesh and sweet taste, while colour of the fruit is rated lower. The United States and European markets prefer a peach which is at least 5 cm. in diameter, firm and with a bright red external colour ( Arnold and Sherman, 1985 ) and some acidity in the flesh. Yellow flesh is seen in all commercial cultivars of peach in the Western countries while flesh colour is not so important in the Asian countries.

The adaptability of the introduced peach varieties in the highland areas of Northern Thailand can be partly represented by the yields obtained. Yield was related to the chilling requirement for various varieties. Varieties with chilling requirements as high as 400 hours, like Florda King peach and Sunlite nectarine may not perform well at Ang Khang which receives about 300 hours of chilling. Based on both yield and fruit quality attributes of the introduced peach varieties in EarliGrande and Fla 5 - 18 are the varieties recommended for Ang Khang. The first is a cling stone while the latter variety is a free stone peach ( Table 3 ).

**Table 3 Characteristics of peach varieties in Thailand.[1]**

| Variety | Flesh color | Freeness of pit | Approx. chilling hours | Average yield per tree ( kg ) |
|---|---|---|---|---|
| EarliGrande | yellow | Cling | 200 | 18.6 |
| Flordabelle | yellow | Semi - Free | 150 | 7.1 |
| Flordared | white | Semi - Free | 150 | 6.9 |
| Flordasun | yellow | Free | 200 | 8.7 |
| Flordaking | yellow | Cling | 400 | 4.0 |
| Maravilha | white | Semi - Free | 200 | 5.1 |
| San Pedro | yellow | Cling | 325 | 9.7 |
| Swellen Grabriel | white | Semi - Free | 250 | 4.8 |
| Tropic sweet | yellow | Free | 175 | 4.9 |
| Fla 2 - 4 | yellow | Free | 300 | 7.1 |
| Fla 5 - 4 | yellow | Free | 250 | 1.8 |
| Fla 5 - 18 | yellow | Free | 225 | 12.0 |
| P 49 | white | Free | 200 | 15.6 |
| P 101 | white | Free | 250 | 5.0 |
| P 105 | white | Free | 250 | 7.0 |
| P 112 | white | Free | 270 | 6.6 |

[1] Based on the performance at the Royal Ang Khang Station. Data averaged from 1982 - 1987

Among the nectarine varieties studied, Sunlite, Fla 5 - 14 and Fla 5 - 13 produced the large - sized fruits. Medium - sized fruits were produced by Sundowner and Fla 3 - 4 whereas Sunred nectarine had the smallest fruits ( Table 2 ), eventhough this variety produced the best bright red color. The performance of these nectarine varieties is different in other places. In Queensland, George *et al.* ( 1986 ) reported the Sundowner variety as producing the biggest fruit, even bigger than that of Fla 5 - 13. This also agrees with the performance of nectarine varieties reported in Northern Chile ( Munnoz *et al.*,1984 ). Apart from the early introduction Sunred, the other nectarine varieties which should be extended to growers in the highlands of Northern Thailand are Sundowner and Fla 5 - 14 since these two varieties produced high yield per tree under the Thai conditions ( Table 4 ).

Fruit quality of some introduced varieties of peach and nectarine was in the range reported in other growing areas such as Florida ( Sherman *et. al,* 1979; Crocker and Sherman, 1983 ), Northern Chile ( Munoz *et al.*, 1984 ) and Queensland ( George *et al.*, 1986 ). The data tabulated in Table 5 show fruit size ( fruit weight ) for low - chilling peach and nectarine varieties cultivated in different regions of the world.

Since many low - chilling peach and nectarine varieties are bred and released from the University of Florida, U.S.A., the characters selected in the varieties released are mainly in accord to the U.S. market preference. However, different countries have different market preferences, therefore, some of the selections by the University of Florida which are not released for the U.S. market and are not known as " named cultivars " may be desirable in other countries. In this study, EarliGrande, Fla 5 - 18 and Fla 5-4 peaches with Sundowner and Fla 5 - 14 nectarines which are not recommended to growers in Florida appear to have commercial potential in Thailand.

## CONCLUSION

The study of performance of the introduced peach and nectarine varieties grown under the highland areas of Northern Thailand at Royal Ang Khang Station during the five growing seasons ( 1982 - 1987 ) can be concluded as follows :

**Peach**

1) Fla 5 - 18 and Florda King yielded large fruit ( over 140 gm ) while Flordared and Floridasun gave small fruit ( 45 - 68 gm ).

**Table 4 Characteristics of nectarine varieties in Thailand.**[1]

| Variety | Flesh color | Freeness of pit | Approx. chilling hours | Average yield per tree ( kg ) |
|---|---|---|---|---|
| Fla 3 - 4 | yellow | Free | 300 | 5.5 |
| Fla 5 - 13 | yellow | Free | 300 | 9.5 |
| Fla 5 - 14 | yellow | Free | 325 | 13.6 |
| Sunlite | yellow | Free | 450 | 3.0 |
| Sundowner | yellow | Semi - Free | 225 | 13.2 |
| Sunred | yellow | Semi - Free | 250 | 4.4 |

[1] Based on the performance at the Royal Ang Khang Station. Data averaged from 1985 - 1988

2) The highest fruit firmness at harvest was found with Fla 5 - 4 while the lowest was Swellen Grabriel.

3) The total soluble solids of the fruit at harvest was in the range of 9 - 10°Brix;- the highest was found in Flordabelle and the lowest in Florda King.

4) The EarliGrande variety gave the highest yield of 18.6 kg/tree, and this variety is recommended for commercial production in Thailand.

**Nectarine**

1) Fla 5 - 14 and Sunlite yielded large fruit of about 100 gm while Sunred produced small fruit ( 45 gm )

2) The highest fruit firmness at harvest was found in Fla 5 - 8 while Sundowner had the lowest figure.

3) The total soluble solids of the nectarine fruits at harvest was, in general, greater than that of peach. The Sunred variety had the highest TSS of 13.34°Brix, while the lowest was Fla 5 - 14 ( 10.62° ).

4) The Fla 5 - 14 and the Sundowner varieties gave yields of about 13 kg/tree and these two nectarine varieties are recommended for extension to hilltribe growers in the future.

**Table 5 Fruit weight of peach and nectarine cultivars in Thailand compared to those reported in other growing areas.**

| Cultivars | weight per fruit ( g ) | | | |
|---|---|---|---|---|
| | Thailand | Florida | Northern Chile | Queensland |
| **Peach** | | | | |
| EarliGrande | 108.06 | 80 | 117 | -* |
| Flordabelle | 88.80 | 120 | -* | 140 |
| Maravilha | 78.08 | 75 | 77 | 100 |
| Flordaking | 140.71 | 95 | 120 | 110 |
| Flordasun | 45.00 | 75 | -* | 100 |
| San Pedro | 90.83 | 85 | -* | 100 |
| Flordared | 67.75 | -* | -* | 120 |
| **Nectarine** | | | | |
| Sundowner | 60.54 | 80 | 140 | 100 |
| Fla 5 - 13 | 86.08 | 80 | 89 | 95 |
| Sunred | 44.78 | 65 | -* | 70 |
| Fla 5 - 14 | 90.86 | 80 | -* | 95 |
| Fla 3 - 4 | 69.08 | 80 | -* | 85 |
| Sunlite | 104.21 | 70 | 85 | 90 |

* No data available

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