ties although in the future we hope to extend our interests to stock material also. In the latter case we would be looking for resistance to Phytophthora and to salinity, both of which are problems in different areas of Australia, and also for a dwarfing rootstock to give a more manageable tree.

Further research is under way to increase the efficiency of the breeding effort. The relative fruit setting and fruit carrying capacity of the available varieties must be investigated so that yields can be maximised by breeding only from the best varieties. Pollen storage also needs attention to enable the crossing of varieties which do not flower at the same time. Pollen/pistil compatibility is being monitored to ensure that the pollinations are resulting in fertilisation and fruit set and the possibility of embryo culture is also under investigation.

We believe that this is the first time that controlled scientific technique has been appied to avocado breeding and we hope to reveal some of the genetic diversity which must be present in a species which has received so little selection in the past. We also hope that by controlling parentage we will learn something of the genetics of the avocado, about which we know very little.

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Blueberry Cultivars for Florida[1]

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Blueberries were first planted in commercial orchards in northwest Florida. Most of the plantings were made between 1890 and 1920 with rabbiteye blueberry bushes *(Vaccinium ashei)* dug from the wild. By 1920 blueberry plantations covered more than 2000 acres in North Florida (1). The rabbiteye blueberry is highly variable, and because bushes were often transplanted without selection for berry quality, fruits from resulting orchards were highly variable in size, color, and flavor.

The irregular quality of early Florida blueberries lowered their market appeal, and after improved cultivars began to be planted in the northern United States, the Florida blueberry industry declined rapidly, with most commercial acreage abandoned before 1940. Although the total acreage of commercial blueberries is presently quite small in Florida, improved cultivars are becoming available with which the industry could be revitalized.

Several factors should be considered in selecting blueberry cultivars for planting in Florida, either as dooryard

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Table 1. Fruit and plant characteristics of rabbiteye and highbush-type blueberry cultivars at Gainesville, Florida.[1]

Cultivar	Pollination[2] group	color	scar	Berry flavor	firmness	size	Plant yield[3]	vigor	Avg. date of blooming	First ripe	Originators[4]
Aliceblue	1	8	7	8	8	7	10	10	mid Feb.	late May	FLA
Beckyblue	1	8	9	8	8	8	10	10	mid Feb.	late May	FLA
Flo	1	8	5	7	7	10	8	9	mid Feb.	late May	Elliot
Woodard	2	9	7	7	9	7	9	8	V. late Feb.	early June	GA
Bluegem	2	10	9	6	9	8	9	10	late Feb.	early June	FLA
Southland	2-3	8	9	8	8	8	7	9	early Mar.	early June	GA
Briteblue	2-3	9	9	8	9	7	7	9	V. early Mar.	early June	GA
Delite	2-3	7	9	9	8	8	8	8	V. late Feb.	early June	GA
Bluebell	2-3	9	9	8	8	9	8	8	V. early Mar.	early June	GA
Climax	3	8	9	8	10	8	8	7	early Mar.	late May	GA
Tifblue	3	10	10	9	9	9	6	10	early Mar.	mid June	GA
Flordablue	4	8	8	8	8	7	8	7	early Feb.	early May	FLA
Sharpblue	4	7	7	8	8	8	8	8	early Feb.	early May	FLA
Avonblue	4	9	9	9	9	9	9	7	mid Feb.	mid May	FLA

[1]For traits other than pollination group, 10 = best phenotype and 1 = poorest.
[2]Cultivars having one or more numbers in common could be planted as a pair for cross-pollination.
[3]Yields are estimates for the Gainesville, Florida area. Results would differ in other winterchilling zones.
[4]FLA = Fruit Crops Dept., University of Florida, Gainesville.
Elliot = Dr. Arthur Elliot, Earlton, Florida.
GA = U. S. Dept. of Agriculture and Coastal Plains Exp. Station, Tifton, Georgia.

plants or in commercial operations. Commercial blueberries are deciduous, and like other deciduous fruits, require a certain amount of cold weather during the winter to stimulate vigorous flowering and heavy fruit set. Thus, cultivars should be selected with chilling requirements suited to the areas in which they are to be grown. For example, 'Tifblue', a Georgia cultivar, often fruits poorly in Gainesville, Florida and southward because winters are usually too mild to stimulate vigorous flowering. On the other hand, low-chilling cultivars developed for central Florida are vulnerable to frost when grown in extreme north Florida, because their chilling requirements are satisfied so early that they may bloom before the last spring freeze. Cultivars should also be selected for resistance to pests such as cane canker, a potentially serious disease present in several native species. Infected wild blueberries act as reservoirs for the canker fungus, from which it can spread to susceptible cultivars. Orchard soil and the amount of care that can be given a planting are also important considerations. Presently-available highbush-type cultivars, such as 'Floridablue', 'Sharpblue', and 'Avonblue', despite their advantages in high berry quality and early ripening, are more exacting in cultural requirements than rabbiteye cultivars, and require more frequent irrigation, soils that contain more organic matter, and/or mulch. Pollination is another consideration in cultivar selection. Most rabbiteye cultivars show considerable self sterility, and two cross-compatible cultivars should be planted together for best results. Rabbiteye cultivars are not good pollinators for highbush-type cultivars, nor are highbush cultivars good pollinators for rabbiteyes.

Cultivars presently recommended for planting in Florida fall into two main groups—rabbiteye and highbush types. These groups have remained distinct in blueberry programs because differences in chromosome numbers have restricted crosses between plants not in the same group. Rabbiteye cultivars are hexaploid and have 72 chromosomes, whereas highbush types are tetraploid and have 48.

Rabbiteye cultivars are vigorous, productive, and easy to grow, but the fruit ripens later, has tougher skins, is seedier, and typically is less flavorful than fruits of the highbush cultivars. New rabbiteye cultivars, however, generally have higher fruit quality than old-line cultivars.

Florida highbush-type cultivars were developed by crossing cultivated blueberry varieties from the northern United States with native lowbush blueberries from South Florida (2, 3). Cultivars in this group have the lowest chilling requirement of any cultivated blueberries, and their fruit ripen about a month earlier than those of typical rabbiteyes. Highbush types, however, require frequent irrigation during dry weather and are more exacting in their soil requirements than are rabbiteyes. Although the early fruit ripening is desirable from a marketing standpoint, it makes the fruit vulnerable to migratory birds.

Table 1 lists the rabbiteye and highbush-type cultivars best suited for Florida. Most of the information was obtained by observing plants in the Gainesville, Florida area. Blooming and ripening dates would be somewhat later in areas north of Gainesville. Both yield and vigor of the cultivars listed vary with locality. The low average yields of 'Tifblue' at Gainesville, for example, are probably due to inadequate winter chilling, and farther north 'Tifblue' may yield as well as or better than 'Woodard'. Traits other than yield, vigor and maturity vary less from region to region. Data are not directly comparable for rabbiteye and highbush-type cultivars in Table 1.

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Germination of Apple Pollen as Influenced by Fungicides

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Abstract

Pollen collected from two apple cultivars was tested in the laboratory for germinability in solutions of the fungicides or bactericides which are commonly applied during bloom to control apple diseases. Dodine significantly ($P = 0.01$) reduced 'Jonathan' and 'Golden Delicious' pollen germination. Pollen grains which did germinate, however, produced germ tubes which elongated at the same rate as controls. Streptomycin at 50 ppm had no effect on either germination or germ tube elongation of 'Golden Delicious' pollen but significantly ($P = 0.01$) reduced germination at 100 ppm. All fungicides applied at recommended rates for disease control significantly ($P = 0.01$) reduced apple pollen germination. Benomyl and sulfur affected pollen germination the least while the dithiocarbamate fungicides (zineb, metiran, dinocap-mancozeb) and captan proved most toxic.

Introduction

The most common and serious pathogens affecting apple production and the diseases they cause are *Venturia inaequalis* (scab), *Gymnosporangium* spp. (rusts), *Erwinia amylovora* (fire blight) and *Podosphaera leucotricha* (powdery mildew). These diseases require that fungicide control measures be initiated prior to and continuing through bloom until disease pressure subsides usually during the summer. Fungicide applications during bloom for disease control are currently recommended by many extension plant pathologists.

Several researchers have reported non-target effects of fungicides on germination of various fruit pollens. Rich (5) observed that captan adversely affected apple pollen germination *in vitro* but not *in vivo*. Eaton (1, 2, 3) found that captan reduced *in vitro* sweet cherry pollen germination, *in vitro* strawberry pollen germination, and *in vivo* apple pollen germination. Shawa, et al (6) reported that captan inhibited cranberry pollen germination in *in vitro* tests. The following report details the effects of captan as well as several other commonly applied fungicides on the *in vitro* germination and germ tube elongation of 'Jonathan' and 'Golden Delicious' apple pollen.

Materials and Methods

Nonsprayed 'Jonathan' and 'Golden Delicious' apple blossoms at the balloon stage were randomly picked on 1 May 1974. Anthers were excised by rubbing the blossoms across a 12-mesh screen. They were dried at room temperature (24° C) for 48 hours in culture plates, and this caused them to dehisce. This preparation containing both pollen grains and floral parts was stored in sealed glass vials at −16° C until used.

A germination medium containing 0.3M raffinose and 0.001% boric acid in glass distilled water was prepared (4). Germination medium (0.4 ml) was placed in each of 12 depressions of porcelain plates. Aliquots (0.1 ml) of fungicide or bactericide suspensions in distilled water containing fivefold the desired test rate was added to each depression thereby leaving a final fungicide concentration equivalent to the rates given below. All rates

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