

O47-16-10: A Pierce's Disease-resistant and Premium Wine Producing Bunch Grape Hybrid with Later Bud Burst in Spring

ZHONGBO REN*, VIOLET TSOLOVA, AND ISLAM EL-SHAKARWAY

Center for Viticulture & Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32317

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'O47-16-10' is a newly developed breeding line at the Viticulture Center, Florida A&M University, Tallahassee, Fl. This premium wine producing bunch grape is superior in being adaptable to Florida's hot-humid growing environment and is resistant to Pierce's Disease. It posses several additional advantages preferred by grape industry, such as self-fertile flowers, high productivity, and low ripe rot during ripening. The later starting of vegetative activity of the vine in spring could minimize the frequent later frost damage for the grape industry in Florida.

Florida grape industry is challenged all the time by Pierce's disease (PD) due to the hot-humid growing environment, which limits growing of *Vitis vinifera* grapes that produce exceptional quality wines to virtually zero in the region. The commercial growing of bunch grapes has solely been based on a few Florida hybrid grapes that are adapted to Florida's hot-humid climate and resistant or tolerant to PD, such as 'Blanc du Bois', 'Stover', and 'Conquistador'. These cultivars could produce good wines, but production is costly due to their susceptibility to other diseases related to heat and humidity such as the fungal disease anthracnose and downy mildew, which require intense spray programs. The ripe rot on 'Blanc du Bois' during ripening might also be a severe problem for both growers and wineries.

Florida grape industry frequently suffers from spring frost damage in addition to the heat and humidity related diseases. These often result in significant production losses or even economic disasters. Open buds and young shoots are sensitive to freezing temperatures, so a short period of exposure to freezing during a spring frost could be lethal to open primary buds and shoots. After severe damage or the death of primary shoots, the subsequent development of shoots from the secondary growing points or buds produce some fruit, but this could be 50% lower than production from primary shoots for most grapes.

With these problems facing the local grape industry, focused continuous breeding efforts to improve existing cultivars and develop new grape cultivars with superior qualities is needed for the development and growth of the grape and wine enterprises, integrating PD resistance, adaption to Florida's hot-humid climate, and fine wine quality. All these would allow a wine grape to be grown successfully in Florida. The grape breeding program in Florida A&M University (FAMU) has been working intensively for the past 2 decades to develop fine wine producing grapes that can grow successfully in Florida. This work has resulted in several valuable hybrids, among which 'O47-16-10' has showed good potential as a premium wine producing selection, and is reported on here.

Origin

'O47-16-10' originated from a cross between 'N18-6' and 'Merlot' in 1999. The female parent 'N18-6' is a complex germplasm line, which has shown a high degree of resistance to PD and anthracnose over the past 20 more years. It also possesses several desirable commercial characteristics such as high yield, high sugar level, moderate vigor, and easy canopy management. It also shows strong tendency to transmit these characters to its decedents. This selection has been used extensively in our breeding programs (Ren, et al. 2009). 'Merlot', the male parent, is a leading premium wine grape cultivar that produces both varietal and blending red wines. 'Merlot' has been less bothered by diseases than other *V. vinifera* cultivars that are PD free and cage-grown in Tallahassee, FL.

The hybrids were planted in Summer 2000, but the majority of them died before 2008 with only a few vines surviving in July, 2020; 'O47-16-10' is one of the survivors. It has been growing well since 2000, has shown a superior adaptability to Florida's environment and has PD resistance. The vine's horticultural potential first received attention in 2005 while its enology traits have been observed since 2007. Both horticultural and enological characteristics have been evaluated and compared with 'Blanc du Bois' and 'Stover', the two most important Florida grown wine cultivars, under same conditions.

Plant and Wine Characteristics

Plant characteristics

FLOWERS AND INFLORESCENCES. 'O47-16-10' produces hermaphrodite (self-fertile, perfect) flowers, as both male and female organs of 'O47-16-10' flowers are fully developed, pollinators are not necessarily required. No cap-sticking which has ever been observed during evaluation indicates that the flowers of the hybrid are healthy. The flower clusters generally grow at 2nd to 4th node (Fig. 1).

PRODUCTIVITY. 'O47-16-10' is highly productive (Fig. 2). A 10-ft canopy of 'O47-16-10' which was vine trained as a 2-arm cordon on a single wire system with spur pruning produced on

^{*}Corresponding author. Email: zhongbo.ren@famu.edu



Fig. 1. Young shoots and inflorescences of 'Blanc du Bois' (top), 'Stover' (middle), and 'O47-16-10' (bottom). The differences in shoot sizes corresponds with vine vigor.



Fig. 2. Fruit clusters and productivity of 'O47-16-10'.

average 18 lb grapes, which was the same as that of the high yield cultivar 'Blanc du Bois', and was more than 'Stover' (Table 1). These yields have been constant during the evaluation period.

The spur productivity of 'O47-16-10' was 417 g fruit/spur, which was similar to the high yield cultivar 'Blanc du Bois', but and greater than 'Stover' (Table 1). As the basic productive part of a grape vine, spur productivity is useful in grape yield studies. It has suggested the high production potential of 'O47-16-10'.

FRUIT CLUSTERS. Mid-large semi-dense fruit clusters weigh roughly 125 g, consist of about 87 individual fruits, the pedicels are partial visible (Figs. 2 and 3). Fruits are movable and it is somewhat difficult to detach fruits from the pedicels. The semi-dense clusters enable air flow and sprays penetrating inside the clusters. These may reduce fruit rot during ripening and is a trait desired by grape growers.

FRUIT PROFILE OF 'O47-16-10'. The fruits of 'O47-16-10' are small and round in shape generally, about 1.3cm in diameter with the length slightly longer than the diameter, and weigh 1.4g (Table 1). Fruit skin is medium thin and smooth with a dark green-yellow color (Fig. 3) and can easily be separated from the pulp. Fruits are semi-soft textured, with neutral or no outstanding flavors.

Fruit sugar content (SSC) averaged 16.2%, titratable acid averaged 0.70g/L with pH 2.98 (Table 1).

Adaptation to hot-humid environment and disease resistance

'O47-16-10' has been growing and fruiting well in Tallahassee, Fla since 2000. During this time, plants have experienced numerous hot-humid related pressures and have shown an outstanding adaptation to Florida's hot-humid growing environment.

Using a 0-5 score criteria, 'O47-16-10' has not shown PD symptoms while light PD symptoms could be observed occasionally on 'Blanc du Bois' and 'Stover (Table 2).

'O47-16-10' showed minor anthracnose symptoms which was lighter than in 'Blanc du Bois' during evaluation period (Table 2).

'O47-16-10' had less fruit rot or ripe rot at harvest. This is a frustrating epidemic for Florida's grape industry. Its 4% fruit rot rate was similar to that of 'Stover', but lower than 'Blanc du Bois' (Table 1). These should make difference for the grape industry; a lower fruit rot rate suggests that growers may be able to harvest more fruit for commercial use while a higher fruit rot rate suggests the opposite.

Vine vigor

The vines of 'O47-16-10' grow vigorously to very vigorously, i.e., the growth of a shoot could easily reach 10 to 20 feet in a growing season. Vine have largr internodes and leaves (Fig. 1, Table 2), which results in a higher pruning weight. The average pruning weight was 5.6 lb/vine from 10-feet of canopy. 'O47-16–10' vines are trained as a 2-arm cordon single wire system with spur pruning techniques, which was the same as the vigorous 'Blanc du Bois', and was higher than 'Stover' (Table 2). The internode size of 'O47-16-10' averaged 11.0cm in length and 1.11cm in diameter, which were larger than the vigorous 'Blanc du Bois' and the moderately vigorous 'Stover' (Table 2). Similarly, 'O47-16-10' has larger leaves (12.8×14.9 cm, L×W) than either 'Blanc du Bois' or 'Stover' (Table 2). Because of its high vine vigor, 'O47-16-10' would not require grafting, which would substantially reduce planting costs.

Later bud break and blooming—Annual growth cycle of the grape vine

The start of the vegetative activities of 'O47-16-10' in the spring is about 3 weeks later than almost all bunch grapes including 'Blanc du Bois' and 'Stover' in Tallahassee, FL (Table 2), which enabled 'O47-16-10' to avoid late frost damage during the evaluation period, while other cultivars frequently suffered

Table 1. Productivity, fruit enological traits, and wine evaluation of 'O47-16-10' compared with two premium Florida wine hybrids

Cultivar	Spur fruit wt (g)	Yield (lb/vine)	Fruit rot rate (%)	Fruit size (g)	SSC (%)	pН	TA (g/L)	Wine score ^z
'O47-16-10'	417	18	4	1.4	16.2	2.98	0.70	13.0
'Blanc du Bois'	428	19	37	2.8	17.9	3.05	0.57	
'Stover'	227	13	4	2.4	15.2	3.08	0.51	12.6

^zAmerican Wine Society (AWS) evaluation standard, total of 20 scores.

SSC = soluable solids content; TA = tritatable acidity.



Fig. 3. Typical cluster and fruit color of 'O47-16-10'.

severe loses (Fig. 4). This late blooming trait would have high potential for grape production areas with spring frost problems.

Wine Characteristics

'O47-16-10' produced a delicious white wine with a clean pale-yellow color, neutral pleasant flavor, clear finish, and excellent stability. The wine score was determined by a taste panel according to the American Wine Society (AWS) evaluation procedure, in which the total 20 scores were divided into: appearance 0-3; aroma and bouquet 0–6; taste and texture 0-6; aftertaste 0–3; and overall impression 0–2. The 13.0 point of the 'O47-16-10' wine evaluation was similar to the 12.6 points of the fine wine made from 'Stover' (Table 1), which means that 'O47-16-10' can produce fine wine. The wine styles of 'O47-16-10' vary from dry to semi-dry; it can be used to produce varietal wine and blending wine.

The major advantages of the 'O47-16-10' as a fine wine producing grape are its superior adaptability to Florida's hot-humid environment, resistance to PD, satisfactory productivity, and ability to produce premium wine. The selection could further benefit the grape industry by having minimal late frost damage during bud burst and blooming in spring.

Literature Cited

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Fig. 4. Developmental stages and frost damage to 'O47-16-10' (top) and 'Stover' (bottom) on 3/16/2017.

Table 2. Horticultural characteristics of 'O47-16-10' and two premium Flo	orida wine	hybrids.
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	Pruning			PD Anthracnose					
	Vine	wt	Internode	Leaf size	symptom	symptom	Bud		Fruit
Cultivar	vigor	(lb/vine)	$(L \times D, cm)$	$(L \times W, cm)$	(0~5)	(0~5)	breakz	Blooming ^z	ripening
'O47-16-10'	vigorous	5.6	11.0×1.11	12.8×14.9	none	1	mid Mar.	late Aprmid May	early-mid Aug.
'Blanc du Bois'	vigorous	5.2	8.0×1.05	9.1×12.2	occasional	3	end Feb.	early-mid Apr	mid July
'Stover'	moderate	2.6	5.4×0.82	6.8 × 8.5	occasional	2	end Feb.	early-mid Apr.	mid-late July

^zBiological stages developed in Tallahassee, FL.

PD = Pierce's desease.