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A COMPARISON OF HOME, LABORATORY AND QUASI-INDUSTRIAL WINE MAKING PROCEDURES WITH 'STOVER' GRAPES

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Abstract. **White table wines were produced from the Florida bunch grape variety 'Stover' employing a typical home wine making recipe, two carefully controlled laboratory procedures and approximations of 2 commercial fermentations. Analytical and sensory data were obtained on the 4-month bottle-aged wines and compared with a commercial wine of standard quality and similar character. Major defects were cloudiness in the home-made sample and a darker color in the quasi-industrial sample that was fermented 12 hrs on the hulls. Judges ranked other wine treatments between 9.9 and 11.3 on a 20 point scale (12 = standard quality). A commercial chablis and several experimental treatments were downrated due to their dryness. The significance of this preference for sweeter wines is discussed in terms of the potential wine consumer. With proper attention to handling, fermentation and storage 'Stover' can be made into an acceptable mild, semi-dry white table wine.**

The wine potential of Florida-grown grapes of both the bunch and muscadine types has been evaluated over the last few seasons and results indicate that acceptable table wines can be produced experimentally from a number of varieties and breeding lines (5, 11). In trials to date the only green bunch grape which shows promise as a table wine is the variety 'Stover.' 'Stover' is a 1968 release with the following characteristics: usually ripens evenly during the first week of July, with clusters weighing 98g, berries 2.4g (1.9 x 1.6cm), flowers self-fertile, juice Brix 17.0°, pH 3.4, titratable acidity 0.70%. Yields when grafted on a nematode-resistant rootstock such as 'Dog Ridge' or 'Lake Emerald' average 4 tons per acre (9 MT/ha). Budbreak of 'Stover' is normal even after unusually warm winters in Florida. Shoots grow rapidly upward, establishing an open leaf canopy of smooth, glossy foliage. 'Stover' is resistant to Pierce's disease, leaf blight, and grape leaf folder, tolerant of downy mildew and black rot, and susceptible to anthracnose. Regular spraying and fertilization are required (14).

'Stover' is a mild flavored, soft flesh grape with fairly good storage stability. It has been moderately successful in fresh market trials, although small berry size and seeds would confine markets to the producing areas and pick-your-own operations (16). Its earliness extends the period of availability of local grapes by about 2 weeks.

.Stover' has consistently produced light, clear table wines with a slight fruity character somewhat reminiscent of a chablis type. Nevertheless, the season to season variability of 'Stover' wine character is probably more than could be tolerated on a commercial basis. Some of this variation is an inevitable consequence of grape composition and handling, but also can be attributed to the wine making procedure. Thus, during the 1977 season a number of wine making trials were conducted with 'Stover' in order to establish the influence of procedural variations upon wine quality. Primary objectives were to improve wine making technique and define the potential of 'Stover' as a wine grape in Florida.

Materials and Methods

Grape handling and wine making procedures were selected to approximate: 1. a typical home wine recipe using only common kitchen equipment; 2. carefully conducted laboratory treatments incorporating some features stressed in enology literature (1, 4, 7); 3. quasi-industrial methods in which the grapes would not be abused but subjected to small-scale approximations of commercial processes (1, 7). Figure 1 is a flow scheme showing procedural details. Major variations in treatments consisted of: L—home recipe, derived from combining features from several sources (8, 9, 10, 15); M—sample of 'Stover' obtained from a nearby commercial vineyard at Orange Lake, carefully selected and processed within 2 hours of picking (all other grapes were obtained from a single picking at an experimental plot of the IFAS Agricultural Research Center, Leesburg); A—light rack and cloth pressing, fermented at 13°C; C—pneumatically pressed juice ameliorated 15% (w/w) with 21° Brix sucrose syrup, fermented at 18°C; E—crushed grapes inoculated, left on hulls 12 hours at 18°C and fermented at 18°C after pneumatic pressing and 15% ameliorated; K—pneumatic pressing, fermentation at 13°C (similar to treatment M, except source of grapes and care in sorting).

Treatments K, C and E which are considered quasi-industrial procedures were from sound grapes and not sorted prior to crushing. Treatments L, A, and M had the few leaves and debris removed. A, M and K were fermented at 13°C.

Crushing (all samples except L) consisted of passing the grapes with stems through a rotary knife crusher of a Runkles Model 17 Cider Crusher-press with a knife clearance of about 1 cm. Except for treatments L and A, all pressing was performed in a small Willmes Pressor (H. C. Stollenwerk, Inc.). Crushed grapes or must (E) were mixed with 2% w/w rice hulls and pressed at 60 psi for 15 min.

At the time of crushing (E) or after pressing, 200 ppm of potassium metabisulfite were added to all samples and the soluble solids adjusted to 21° Brix with sucrose. All samples were inoculated with Montrachet #522 dried yeast (Universal Foods Corp.) @ 0.4 g/kg must, rehydrated at 40°C prior to use. Fermentation in 18°C or 13°C constant temperature rooms were conducted in 3 or 5 gallon glass jugs fitted with water traps.

Analyses consisted of pH (glass electrode); soluble solids —degree Brix, (Abbe refractometer, temperature adjusted) and titratable acidity as percent tartaric acid—pH 8.1 end point. Fermentations were sampled periodically for alcohol by refractometer (3) and dealcoholized Brix (extract). When the fermentations had either stopped or reached the desired alcohol or extract level, the wines, except L which received periodic rackings, were decanted from the precipitated tartrates and filtered through No. 8 Ertel cellulose filter disks using hyflo super cell filter aid. The clarified wines were filled into clear glass bottles, sealed with plastic screw caps and stored at 13°C.

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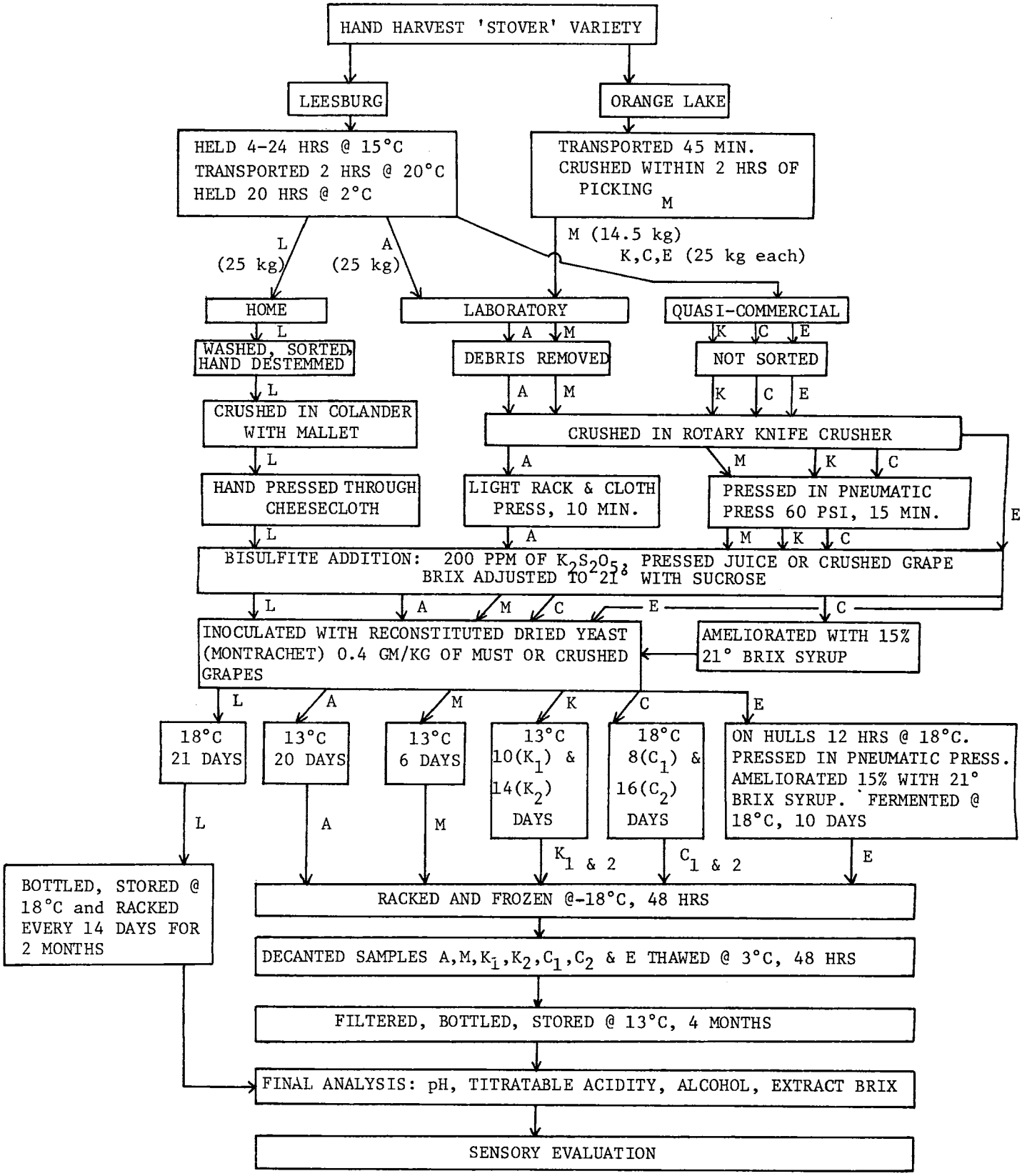

Fig. 1. Flow scheme of wine making treatments.

After 4 months, the wines were analyzed for pH, titratable acidity, alcohol, extract and color—lightness by transmittance in a Gardner Color Difference Meter using distilled water as the standard. Sensory evaluations involved randomly presenting single samples in wine glasses at about 15°C to a semi-trained panel of judges all of whom had an above average interest in wines. Samples were presented individually to minimize carry-over effects or comparisons between treatments. Panelists were asked to develop and maintain an image of what in their opinion constituted a standard white table wine and to rate samples on a 20 point score sheet (Figure 2) modified from Amerine and Roessler

(2). An unmarked sample of standard quality white chablis was included for comparative purposes and acted as a control. All presentations were triplicated and sensory data subjected to analyses of variance and Duncan's multiple range test (2).

Fig. 2. Score sheet used in sensory evaluation.

WINE EVALUATION FORM

NAME:.....

Please evaluate this wine sample based upon your personal experience and image of what an acceptable wine should be. An "ordinary" commercial table wine should merit a total rating of about 12/20 on a 20 point scale (i.e., appearance = 3/4, odor = 2/4 and taste = 7/12).

SAMPLE CODE	
APPEARANCE	
Ordinary sound wine	3
Outstanding color and clarity (+1)	
Defects (−1 to −3)	
Reason for +'s or −'s	
ODOR	
Ordinary sound wine	2
Positive attributes (+1 or +2)	
Defects (−1 to −2)	
Reasons for +'s or −'s	
TASTE	
Ordinary sound wine	7
Positive attributes (+1 to +5)	
Defects (−1 to −7)	
Reason for +'s or −'s	
TOTAL WINE RATING (0 to 20)	

Results and Discussion

The 'Stover' grapes were in good to excellent condition prior to processing. The small amount of debris present—leaves, loose stems and immature berries were removed except in treatments C, E and K, since such careful sorting would not be practical on a large scale.

Table 1 presents data derived from this study. Of primary interest in wine making is the soluble solids and acidity of grapes. This depends upon variety as well as overall maturity, presence of immature fruit (a reflection of harvesting practices or evenness of ripening), season, location and manner of juice extraction. This latter factor is more critical than often realized. For example, light crushing and immediate analyses of juice yields lower acid and slightly higher Brix values than the same crushed grapes when left on the hulls or pressed. Free-run Brix values of 16.1° - 16.5° were a little lower than the previous 5 year average (17.3°) and required the addition of sugar to achieve 21° Brix musts. Most Eastern *U.S. grapes require* such amelioration. However, amelioration with water is not permitted, if this will reduce the acidity to below 0.5% (17). Although the free-run acidity was 0.41%, compared to a 5 year average of 0.52%, treatments E and C could tolerate 15% amelioration, since prefermentation treatments produced adequate acidity to compensate for this 15% dilution (in addition to sugar adjustment to 21° Brix). Fully ripe 'Stover' has the potential of about 0.7 to 0.8% acid, if acid extraction is increased by holding and pressing techniques. Although similar in appearance and flavor, 'Stover' from Orange Lake were more acid than Leesburg grapes. It is unclear from this first harvest if the phenomenon is due to maturity, season or location.

'Stover' has the desirable characteristic of reduced browning compared to other Florida green bunch grapes. The addition of 200 ppm potassium bisulfite ($K_2S_2O_5$ ~ 115 ppm SO_2) soon after crushing effectively reduced subsequent darkening.

The home recipe treatment was included for comparative purposes and to gain some insights into home procedures in order to answer the numerous inquires on this subject (6). The 200 ppm $K_2S_2O_5$ was roughly equivalent to 1/4 teaspoon of granular powder/gallon of juice and approximated the level recommended in home recipes (10). Some instructions called for adding both sugar and water to crushed grapes and may even include a cooking step. In the interest of quality and treatment standardization, only sugar at 59g/kg juice (~ 1 cup/gallon) was added to achieve a 21° Brix must. Aside from the tedious hand operations, the primary difficulty with the home procedure involved clarification. Rackings at 2 week intervals over 10 weeks produced a light wine which was reasonably clear, yet distinguishable from other wines which were cold stabilized and filtered.

Yield data on small batches is of indicative value only because of retention losses and pressing geometry varia-

Table 1. 'Stover' juice/wine analytical data.

	Treatment[z]							
Analysis	A	C	E	K	L	M	WHITE CHABLIS	
JUICE								
pH	3.4	3.4	3.4	3.5	3.5	3.1		
Acidity (%)	0.41	0.54	0.7	0.68	0.65	0.86		
Brix (°)	16.1	16.9	16.1	15.8	16.5	16.5		
Yield (%)	40	64	69	54	63	73		
Wine Code	A	C_1	C_2	E	K_1	K_2	L	M	#1
WINE									
L Value	95.4	95.9	96.0	91.0	96.2	96.2	cloudy	95.1	99.5
pH	3.3	3.4	3.3	3.4	3.2	3.3	3.3	3.2	3.3
Acidity (%)	.50	.63	.61	.57	.60	.60	.71	.73	.72
Alc. (%)	11.4	10.9	11.5	12.6	10.0	11.7	12.5	11.2	11.8
Brix Extract (°)	3.5	4.3	3.8	2.6	5.1	3.5	1.6	3.9	3.0

[z]See Fig. 1 for treatment designation.

tions. Rack and cloth pressings yield about 60% juice (a light press ~ 40% + 20% more with increased pressure). The pneumatic press yields were about 70% and a hot press-enzyme treatment yielded 80%. (The resulting wine was too low quality for evaluation). There was no obvious advantage of light rack and cloth pressing over pneumatic pressing relating to color or wine quality. Had the grapes been received in poorer condition or with excessive extraneous material, pressing regimes might have been more critical.

'Stover' wines seem to mature fairly rapidly and change little over several years at ambient storage. Thus, 4 months at 13°C was deemed an adequate, but minimum storage period. Table 2 shows the sensory evaluation data. Statistical analysis of wine ratings indicated a significant different (5% level) between treatments A,C_1,C_2,K,K_2,M

Table 2. Sensory Evaluation of Experimental 'Stover' Wines and a Commercial Chablis.

Treatments	Appearance 0←2→4	Aroma 0←7→12	Flavor 0←7→12	Total[z] 0←12→20
Home				
L	1.98	1.66	4.06	7.75b
Laboratory				
A	2.79	1.90	5.88	10.63a
M	2.81	1.34	5.76	9.95a
Quasi-Commercial				
C_1	2.51	1.98	5.88	10.41a
C_2	2.65	1.80	6.13	10.40a
E	2.50	1.52	3.45	7.54b
K_1	2.73	1.79	6.66	11.30a
K_2	2.56	1.86	5.50	10.01a
Commercial California White Chablis	2.70	1.30	3.80	7.79b

Means followed by the same letter are not significantly different at the 0.05 probability level.
[z]Ordinary commercial wine = 12/20.

and treatment E,C and the commercial chablis; no significance among replications; and very high significance among judges (1%). No treatment received a rating of 12, equivalent to a standard commercial wine. The least acceptable wine, E = 7.5 - 12 hrs on hulls followed by 15% amelioration and fermented at 18°C, was the darkest and termed harsh, sour, bitter by some panelists. The home procedure, L was dry, slightly cloudy and rated 7.8. The preferred treatment K_1 = 11.3 was unameliorated, fermented at 13°C and racked at about 5° Brix extract. The companion sample K_2 = 10.0 was fermented 4 additional days to 3.5° Brix. Treatments C_1 and C_2, handled similarly to K except for 15% amelioration and 18°C fermentation, both scored 10.4. The lab treatments A, light press = 10.6 and M, Orange Lake grapes, pneumatically pressed = 9.9, both fermented at 13°C were no improvement over quasi-commercial treatments C and K.

The most untenable aspect of this study was the low 7.8 score given to the commercial chablis. We had previously experienced difficulty getting an unambiguous acceptability measure of either experimental or established commercial wines. This we attributed to panel logistics and the complex nature of wine acceptance criteria.

While wine (or at least the idea of wine tasting) is quite popular among University of Florida students, their rather subjective (erratic?) response to various wine types led us to select judges from among faculty and staff, thus neglecting input from a large, heterogeneous potential consumer group. The consumption characteristics of judges is shown in Table 3. Even the more knowledgeable panelists (by Gainesville standards) might be termed novices in regions of appreciable wine production and consumption. Nevertheless, all judges were wine drinkers with an above average interest in wines as reflected by their regular consumption of wines at home and when dining out.

Table 3. Wine consumption characteristics of the 12 judges used in this study.

Price/Liter		Preference (in order mentioned)	Consumption/Week	
Range	Average		Range	Average
$2.00 to $6.20	$4.20	Burgundy Rosé White Chablis Light dry Sangeria	120 ml to 2.2 L	630 ml

Obvious defects are consistently picked by most judges and such wines are rarely presented, being rejected by preliminary screening (such as the hot press treatment). It is the more subtle difference in appearance, aroma, acidity, sweetness and balance which gave the greatest discrepancy in scores. For example, 2 California chablis differing about 100% in price were screened for use as a reference sample. The lower price wine was chosen as better quality, rating 13-14 in blind tasting by the first 2 authors compared to 12-13 for the higher priced one. The rating of 7.7 received by this wine indicates that judges did not have a well defined image of a standard wine, at least chablis.

The major objection to the lower ranked wines was excessive sourness (Table 2). (No sample exceeded a moderate 0.73% acid, so noted sour character probably reflected dryness). Judges preferred the sweetest treatment, K_1; generally rating those of less extract lowest. In unreplicated trials the commercial chablis with 1% added sugar when presented to the same 12 judges received a mean score of 9.9, and L after several more rackings and addition of 2% sugar rated 9.7, both values about 2 points more than their unsweetened scores. Thus, the panelists preferred semi-sweet wines. This preference for sweeter wines presents both advantages and disadvantages to the winemaker. By the judicious use of sugar and/or blending it is possible to produce quite acceptable wines from average quality grapes and, under certain circumstances, to even remedy minor defects. However, attempting to mask deficiencies simply by sweetening is an all too frequent practice with recently introduced "pop" wines and in our opinion leads to "alcoholized, noncarbonated soft drinks". Sweetness can also mask or detract from desirable flavor associated with dry wines and thereby decrease the distinctness which a well balanced dryness can provide.

Previous experience indicated that wines with 1 to 3% residual sugar (3-5% extract Brix) were usually more acceptable than the same treatment fermented to dryness and often better than the dry wine sweetened to the same level as the residual sample. This phenomenon may partially reflect difference in alcohol content and requires elaboration, since lower alcohol wines are increasing in popularity (12). For proper stabilization and economy it is preferable to handle wines dry and sweeten only upon final bottling followed by pasteurization. Yet if quality can be improved by early racking, this practice should be considered.

There were no clear distinctions which could be attributed to fermentation temp in the 5°C range employed. In previous studies wines fermented at > 25°C seemed

poorer in quality. Amelioration with sugar syrup tends to reduce the already mild, fruity character of 'Stover' and, although desirable economically, may reduce wine quality-treatments, K (unameliorated) vs C (ameliorated). By judicious blending of 'Stover' with higher flavored wines a range of wine types could be produced, as is done with 'Thompson Seedless' in California, but blending was outside the scope of this study.

Were we to recommend a procedure for 'Stover' wine based on our personal preferences, it would approximate treatment M. This wine differs mainly in source of grapes and residual sugar from treatment K_1, preferred by the judges, which probably more closely reflects the preference of the potential Florida consumer.

'Stover' is not the ultimate in a Southeast wine grape, although it is quite acceptable for home or small scale wine making. Breeding efforts resulting in new grapes with improved cultivation characteristics should lead to a gradual improvement in winemaking potential. With wine consumption in Florida at 1.65 gallons/capita, a little above the national average of 1.85 (13) and locally produced wines presently an unmeasurable fraction of this consumption, the opportunity exists to take greater advantage of 'Stover' and its successors.

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QUALITY CHARACTERISTICS AND NUTRITIONAL COMPOSITION OF BONIATOS (IPOMOEA BATATAS). I - CULTIVAR QUALITY[1]

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Abstract. **Six cultivars of boniatos were grown at Homestead during three production seasons. Cultivars were 'Del Valle', 'Green Stem Original', 'Red', 'Five Fingers', 'White', and 'Rojo Blanco'. Boniatos were harvested at maturity and analyzed for specific gravity, total solids, vitamin C. and internal color. 'Five Fingers' had the highest specific gravity and total solids; vitamin C content and color were also relatively high. Cultivars 'Red', and 'White' were intermediate in quality. Although 'Del Valle' and 'Green Stem Original' both had very good color their specific gravity, total solids, and vitamin C content were low. 'Rojo Blanco' was the least desirable of the group based upon the internal quality characteristics measured.**

Boniatos, also known as 'Cuban' sweet potatoes are a cultivated form of the regular sweet potato (*Ipomoea batatas* Lam.). In the Southeast U. S. and Latin America, the most preferred boniatos are those having white flesh, high solids and bland flavor. They have been grown in parts of the tropical world for centuries, but have not gained acceptance in the U. S. until well after the Cuban migration beginning in the 1960's. Production in Florida has been of no consequence until recently when unofficial estimates ranging up to 12,000 acres annually have been made. Most boniatos are marketed in Florida and U. S. cities which have concentrations of Latin Americans but a significant portion of the crop is exported to Puerto Rico.

Little is known concerning the composition of boniatos. Major criteria for quality evaluation have been whiteness of flesh, dry matter content, and low sugars. Yellow fleshed sweet potatoes contain high levels of Vitamin A but unfortunately boniatos contain very small amounts because of the white flesh.

In general, few pure line cultivars of boniatos are grown in Florida and almost nothing is known about their origin. All are known only by common names which reflect some easily distinguishable characteristic.

There has been no organized program to identify, maintain, or improve quality characteristics of boniatos. Presumably the quality of boniatos could be improved by the same cultural practices and varietal development programs

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