

Coffee Varieties and Cup Quality



Balancing plant health and
economics with cup quality

Coffee varieties

- ❑ Based on the history of coffee and how it has spread throughout the world
- ❑ Different ways that diverse varieties occur
 - Spontaneous occurrence due to natural genetic crossing or mutation
 - Intentional crosses made between existing varieties
 - Physical manipulation: root stock grafted to stems (not a truly different variety)
 - New methods: genomic analysis, manipulating genetic expression, gene splicing

Issues in developing coffee varieties

- Maintenance or improvement of cup quality
- Resistance to disease, parasites
- Better adaption to physical surroundings (available water, sunlight, soil conditions)
- Greater productivity
 - More plants per hectare
 - More seeds per plant

Specialty market

- Recent preference for “heirloom” (older) varieties noted
- Most new varieties were developed in conjunction with traditional “coffee liquorers”
- “The question which arises is whether the time old quality criteria used by the veterans of organoleptic assessment of coffee quality are still relevant under the specialty coffee arena or whether new quality criteria have since emerged.” –*Agwanda, Omundi, Wamatu (Ruiru Research, Kenya): Breeding for Speciality Coffee Markets: What Options Do the Coffee Breeders Have? ASIC 2001*
- What is the situation with Cup of Excellence?

Outline of presentation

- History of *Coffea Arabica* and how it spread throughout the globe
- A few varietal/genetic terms defined
- Development of different strains; how and why they were developed
- Current issues in planting coffee varieties
 - Productivity vs. cup quality
 - Importance of varieties from a marketing viewpoint
- Why is it relevant to the coffee industry?
- Cup of Excellence results: do certain varieties tend to win?
- Tastings: different varieties grown under different conditions

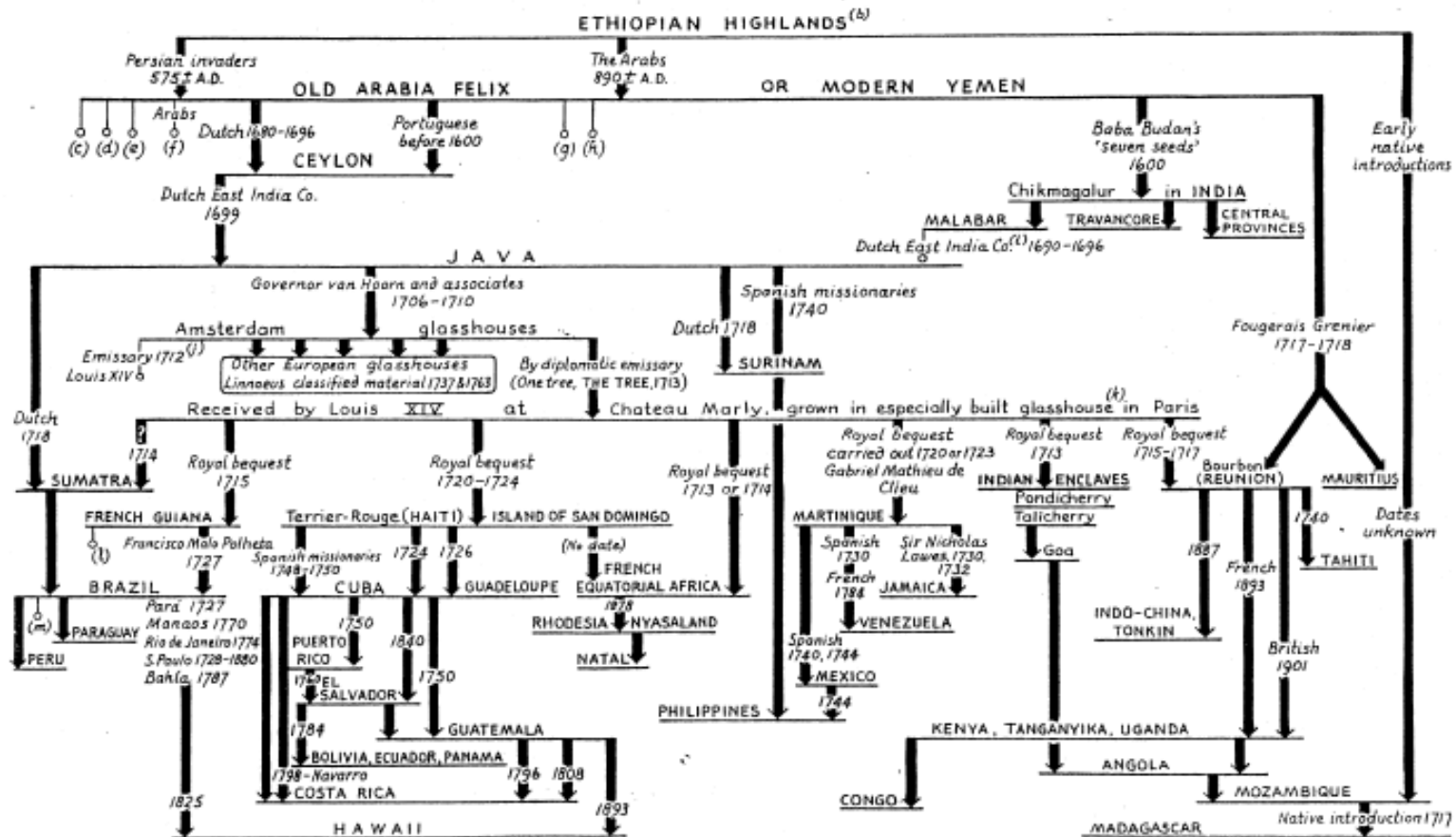
A few definitions

- Genotype: the actual genetic code
 - Genes made up of pairs of chromosomes: two “double helix” forms (DNA)
 - In coffee, 22 pairs
- Main difference between Arabica and Robusta: Arabica is self-pollinating
 - Tetraploid ($2n=4X=44$)
 - Arabica is more stable from a genetic point of view
- Different varieties appear to emphasize different manifestations of original genome
- Retrotransposons: appear predominantly in plants and often amplify themselves and induce mutations quickly in response to conditions (wheat = 90% transposons)

Genetic history

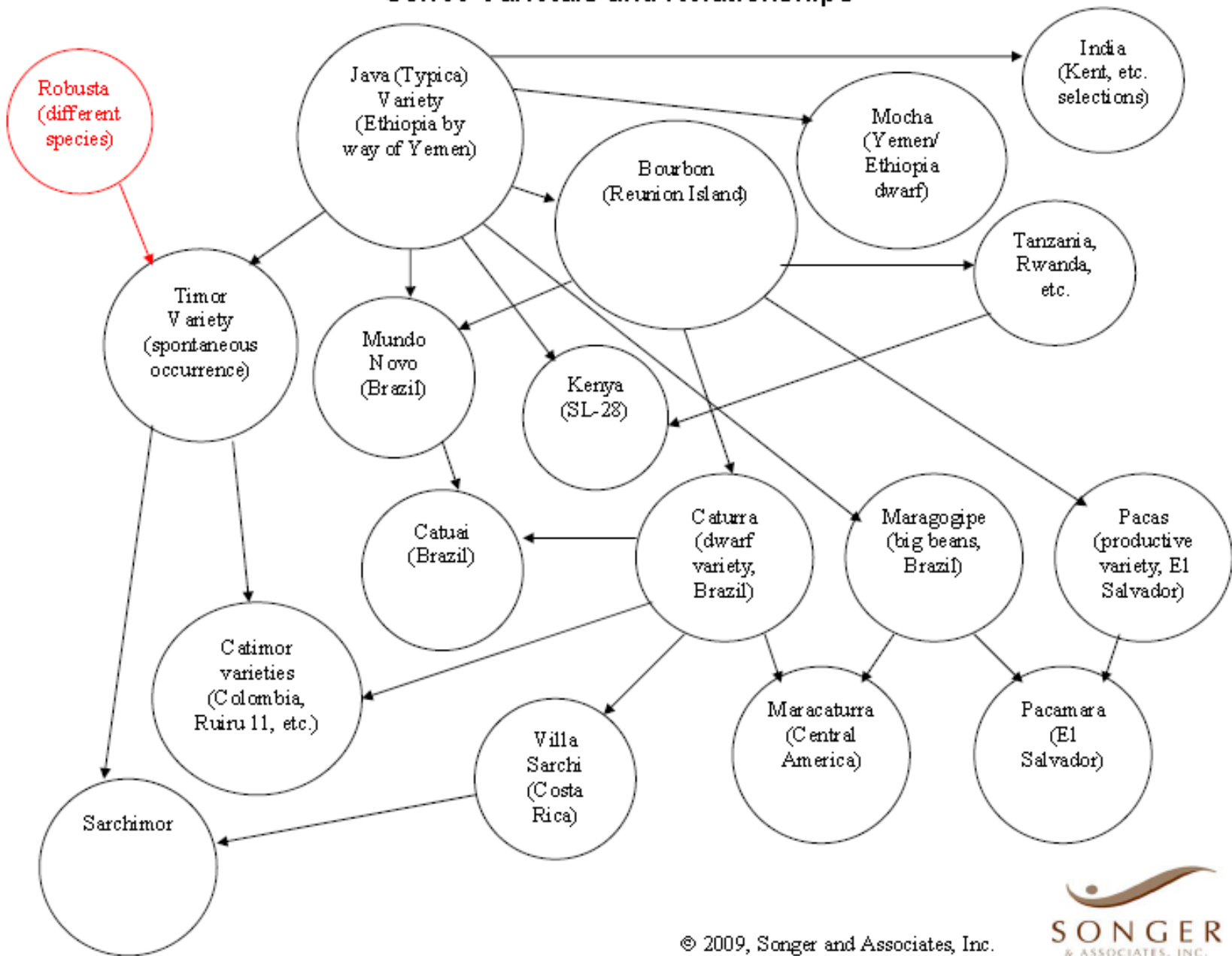
- *Coffea Arabica* the result of the mutation of mutually pollinating trees
 - *C. Canephora* and *C. Eugenoides* (CIRAD)
- However, the coffee genome contains many retrotransposons that can respond in different ways according to growing conditions
- Much coffee varietal selection dependent desirable characteristics (inconsistently found) and adaption to specific conditions
 - Selections, including spontaneous occurrences
 - Intentional breeding for certain qualities

History of coffee propagation

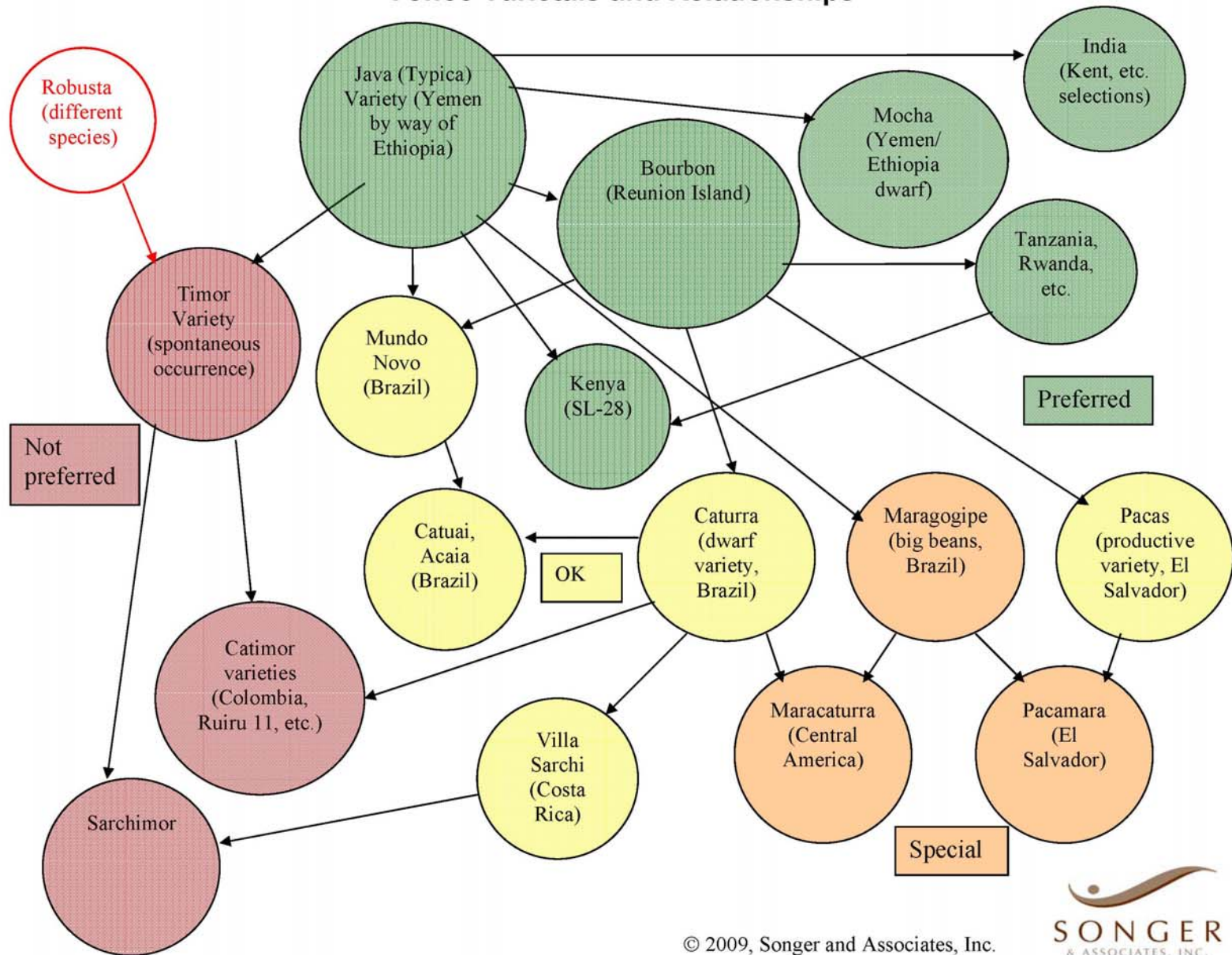


From Wellman, Frederick L., Coffee, 1961: World Crop Series, Leonard Hill Books

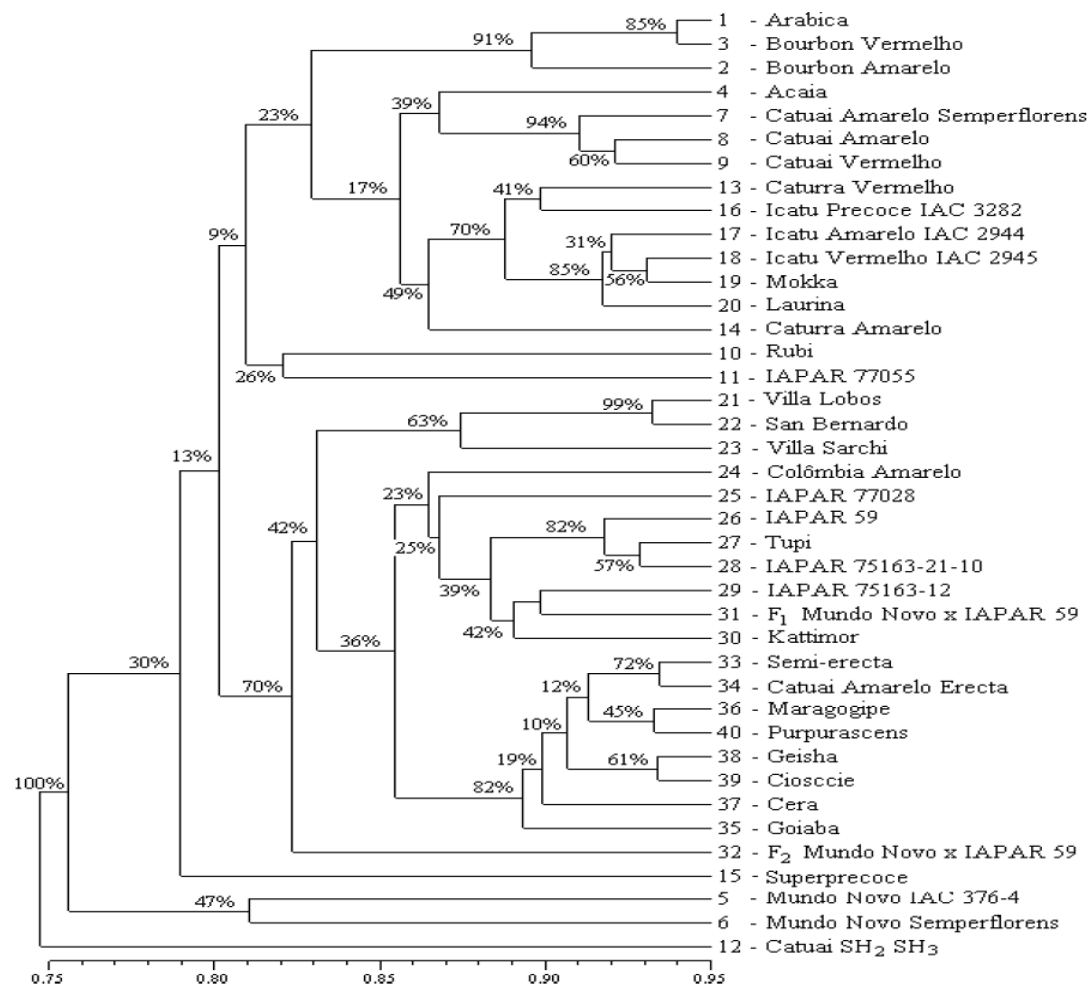
Coffee Varietals and Relationships



Coffee Varietals and Relationships



Another look: Dendrogram based on DNA



Source: Dinez et al:
Genetic Diversity
Among Forty Coffee
Varieties Assessed
by RAPD Markers
Associated with
Restriction Digestion,
 2005: BRAZILIAN
 ARCHIVES OF
 BIOLOGY AND
 TECHNOLOGY, Vol.
 48, no.4, p. 518

Results for COE competitions

Brazil	2003	2004	2005	2006	2008
Catuai	4	4	1	2	
Bourbon	4	4	7	5	7
Mundo Novo	2		1		
Acaia		1			1
Icatu		1		1	
Blend			1	1	2
Obata				1	

Guatemala	2006	2007	2008	2009
Catuai	1		1	1
Bourbon	3	2	3	3
Caturra	1		2	
Typica	1			
Pache	1			
Blend	3	7	2	2
<u>Pacamara</u>		1	1	4
<u>Maracaturra</u>			1	

Major aspects of coffee quality, regardless of variety

- ❑ Harvesting ripe cherry
- ❑ Proper processing: removal of the cherry from the seed in a way that does not add negative flavor attributes
- ❑ Historically expensive and difficult to manage
- ❑ No introduction of new varietal is likely to change this, at least for the specialty market

Technical role of Cup of Excellence

- Selection of coffees with unique sensory qualities that are particularly valuable
 - Small lots with limited genetic material and defined “micro-climate” growing conditions
 - Selection process is based upon replication of preparation and jury submission
- Establishment of standards for sample preparation
- Increase the cupping skill of participants, especially in growing countries

Name: _____

Round 1 2 3 Session 1 2 3 4 Country

Cup of Excellence™ 2001 Coffee Competition

© G H Howell Co Jan 23, 2002

SAMPLE

ROAST
COLOR
DEVIATION

<3> ←0→ +3
AROMA
DRY CRUST BREAK

i x # x 2 = SCORE
i = <1> to <3>
DEFECTS

CLEAN
CUP

SWEETNESS

ACIDITY

MOUTh.
FEEL

FLAVOR

AFTeR-
TASTE

BALANCE

OVERALL

TOTAL

_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>
_____			__x__x 4 = <input type="text"/>									<input type="text"/>

Today's tasting: close relatives on the Dendrogram

