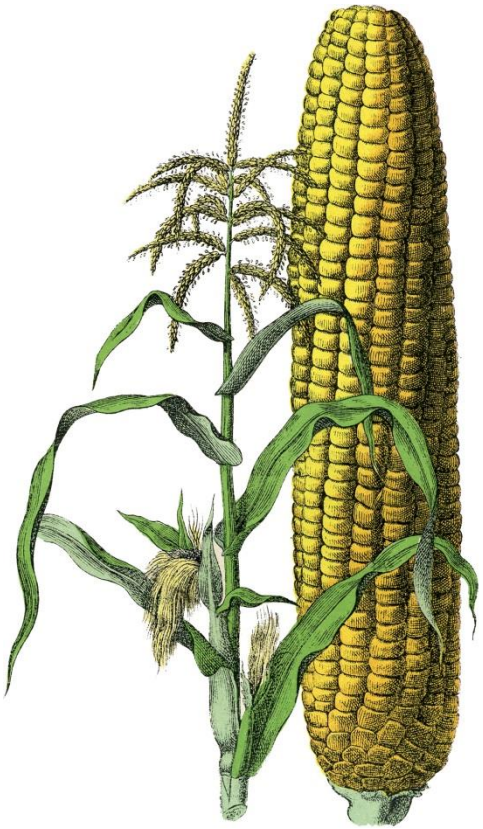
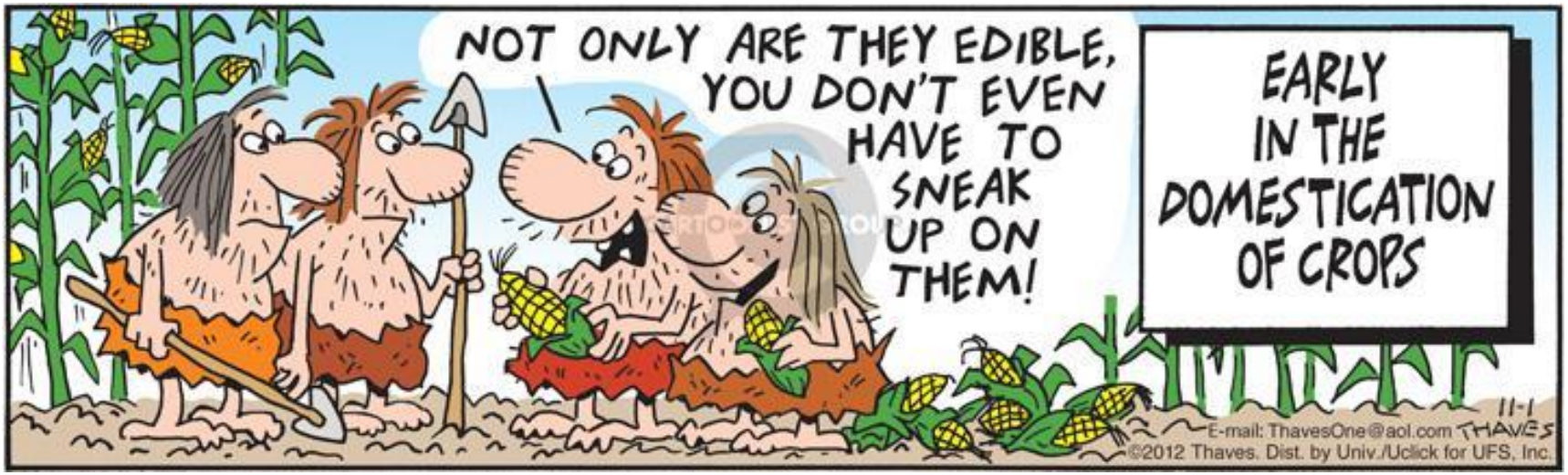
Olericulture – Hort 320
Lesson 14 – Sweet Corn, Misc.

Jeremy S. Cowan
WSU Spokane County Extension
222 N. Havana St.
Spokane, WA 99202
Phone: 509-477-2145 Fax: 509-477-2087
Email: jeremy.cowan@wsu.edu




NOT ONLY ARE THEY EDIBLE, YOU DON'T EVEN HAVE TO SNEAK UP ON THEM!
EARLY IN THE DOMESTICATION OF CROPS
11-1
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Sweet Corn

Sweet Corn

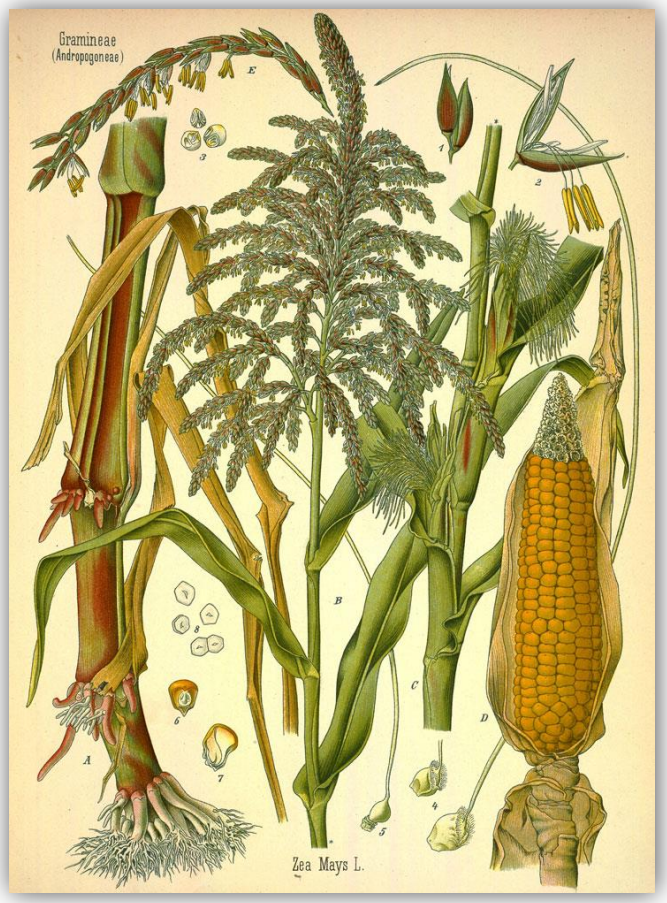
Taxonomy

Monocotyledon

Family: Poaceae (Graminae)

Genus and species: *Zea mays* L. var. *saccharata* Sturt.

Related species: field corn, teosinte, sorghum, wheat and other small grains, grasses



Sweet Corn

Origin and Domestication

Corn originated in Mexico

Possibly derived from teosinte (*Zea mexicana*)

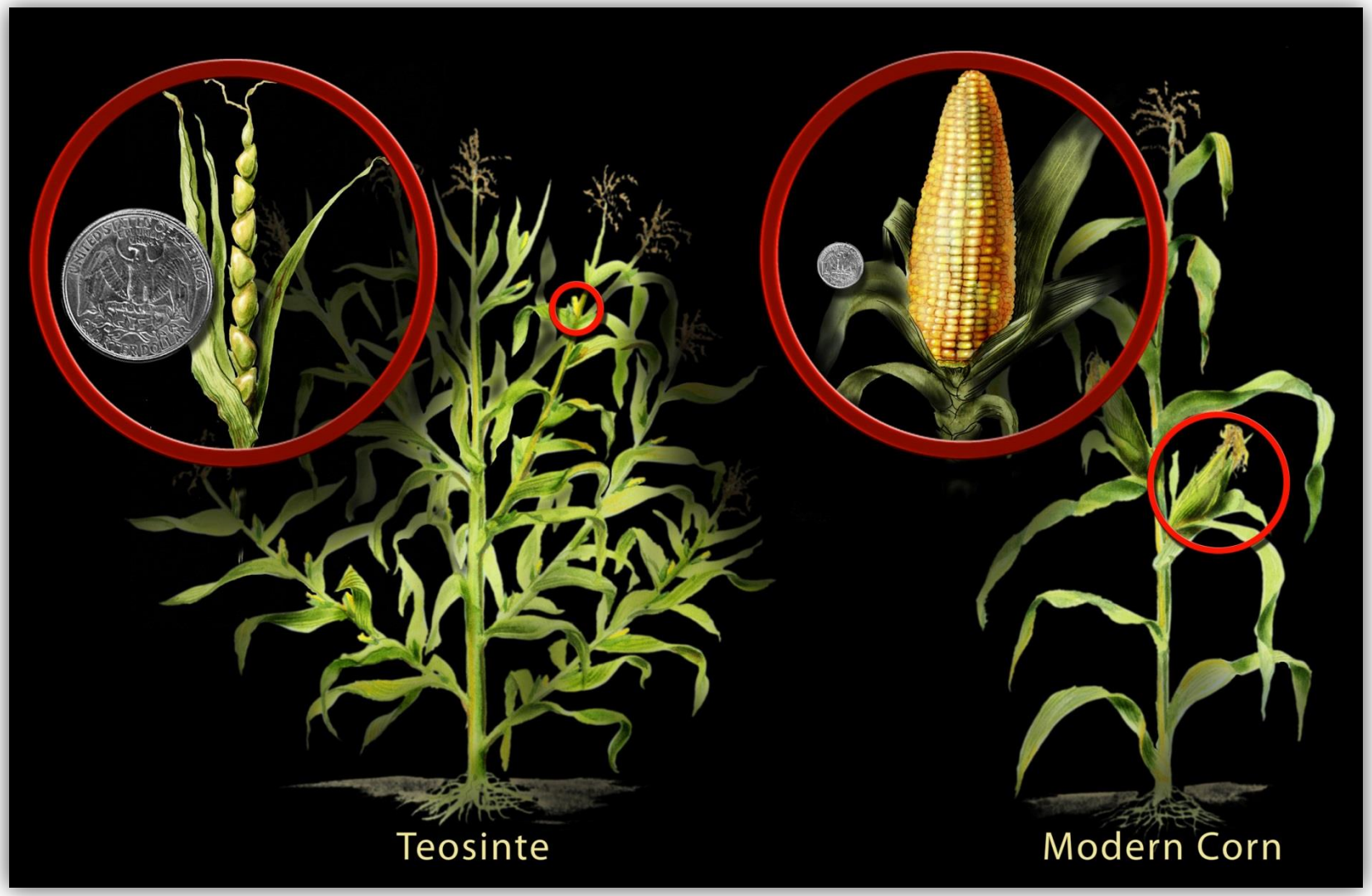
Used as early as 5000 BC

Sweet corn is a recent crop, 8th century in Guatemala

Sweet corn results from the *su*1 mutation

Many modern varieties derived from India

Teosinte



Landrace Corn

Sweet Corn

Importance of Corn

General corn information

One of the major grains for human nutrition – one of four most important crops

The major cereal crop used for stock feed

Produced throughout the world

Largest producers are U.S., China, Brazil, Russia, Mexico, Argentina, Romania

Sweet Corn

Importance of Corn

Sweet corn

Production dominated by the U.S. where development of this crop began among the Iroquois (>500,000 A)

Considerable production in Europe

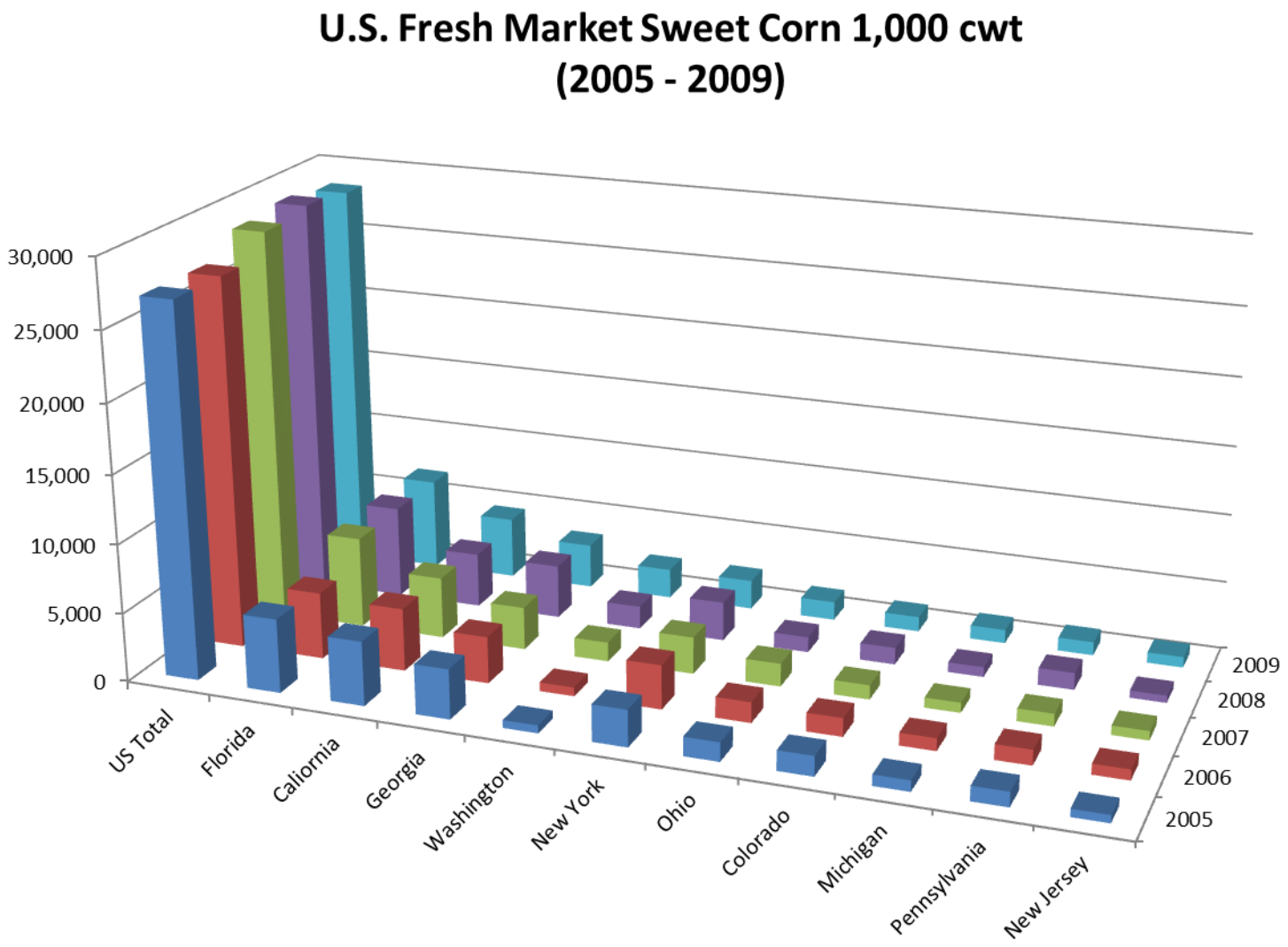
Important source of calories, vitamin A, minerals, lipids, and protein

Sweet Corn

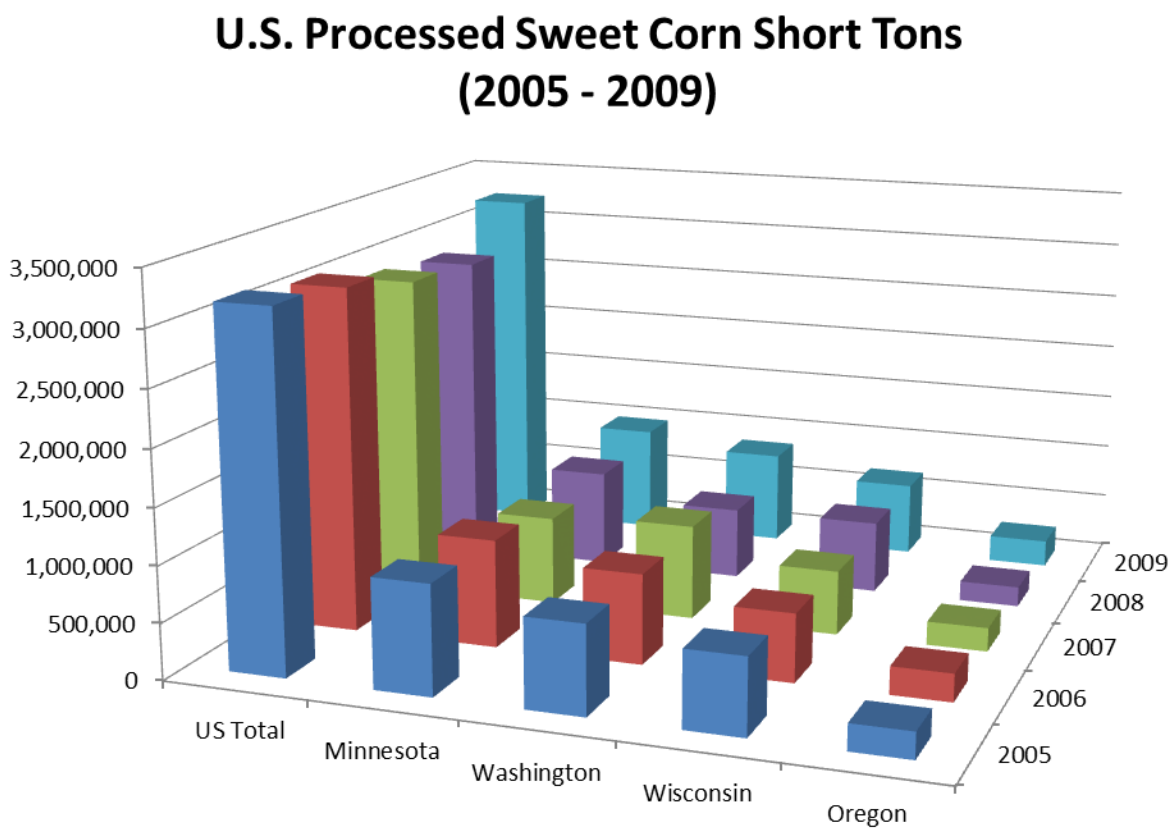
Major producing countries (2008)

Unites States	3,888,080 tonnes
Mexico	610,593
Nigeria	579,000
France	521,916
Hungary	514,000
Peru	332,255
Indonesia	332,000
South Africa	310,000
Thailand	305,000

Sweet Corn


U.S. Fresh Market Sweet Corn 1,000 cwt
(2005 - 2009)
30,000
25,000
20,000
15,000
10,000
5,000
0
US Total
Florida
Caliornia
Georgia
Washington
New York
Ohio
Colorado
Michigan
Pennsylvania
New Jersey
2009
2008
2007
2006
2005

Sweet Corn


U.S. Processed Sweet Corn Short Tons
(2005 - 2009)
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
US Total
Minnesota
Washington
Wisconsin
Oregon
2009
2008
2007
2006
2005

Sweet Corn

Botany

Annual

Monoecious

- Male flower a loose terminal panicle
- Female flowers on an axillary rachis

Pistillate “silks”

Sweet Corn

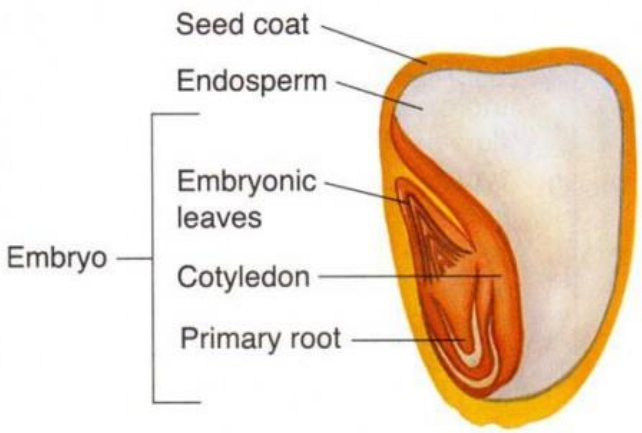
Xenia

Pollen-induced changes in kernels of sweetcorn apparent on the harvested ears.

Some of these changes may be intended and beneficial.

These changes are of most concern when they result in a loss of cob or kernel quality by adversely changing kernel color, kernel weight, embryo weight, soluble solids percent, kernel moisture, or cause other undesirable direct and indirect effects.

Sweet Corn



Xenia

TABLE 15.3. POLLEN EFFECT (XENIA) ON SWEET CORN KERNEL COLOR

Pollen source	Expected genotype kernel color	Result
Yellow	White	Some yellow kernels among white
Mixed (W/Y)	White	Few yellow kernels among white
Yellow	White/yellow	White and yellow, with more yellow than white kernels
White	Yellow	Yellow kernels, no effect
White	White/yellow	White and yellow, no effect

Sweet Corn

Types of corn

Dent – field corn, most widely grown type, used for dry cereal food and industrial purposes

Flint

Popcorn

Flour

Sweet

Waxy

Sweet Corn

Types of corn

Dent

Flint – field corn, smooth hard kernels with little soft starch, grown in Europe and SA

Popcorn

Flour

Sweet

Waxy

Sweet Corn

Types of corn

Dent

Flint

Popcorn – field corn, smooth hard kernels with little soft starch, grown in Europe and SA

Flour

Sweet

Waxy

Sweet Corn

Types of corn

Dent

Flint

Popcorn

Flour – large kernels with soft starch, native use

Sweet

Waxy

Sweet Corn

Types of corn

Dent

Flint

Popcorn

Flour

Sweet – low in starch, high in sugars

Waxy

Sweet Corn

Types of corn

Dent

Flint

Popcorn

Flour

Sweet

Waxy – kernels lack amylose, used for starch

Sweet Corn

Corn Characterization and Genetics

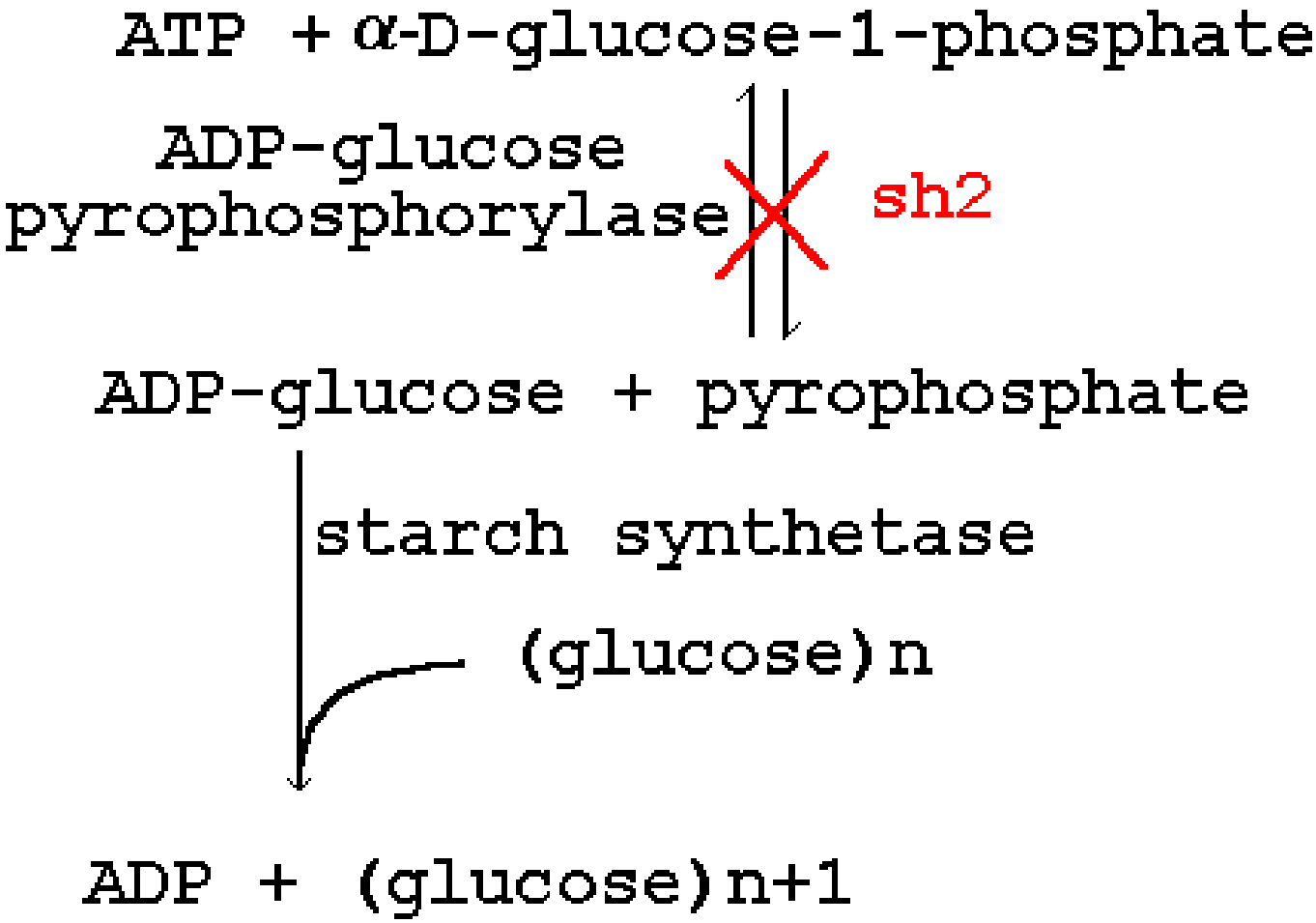
Sweet corn differs from field corn by 1 or more genes

su1 (sugary) allele on chromosome 4
increases WSP, phytoglycogen

se (sugary enhancer) allele on chromosome 4
enhances sugar level in comb with *su*

sh2 (shrunken 2) allele on chromosome 3
blocks starch synthesis (4-8x sugars)

Sweet Corn



Mode of action – sh2 gene in corn

Sweet Corn

Secondary effects of the *sh2* gene

Tough pericarp

Minimal starch reserves

Very shrunken, mummified seed

Slow and weak emergence following planting

More susceptible to seedling diseases

Sweet Corn

Corn Characterization and Genetics

Endosperm is the nutritious part of the kernel

Endosperm originates from pollination event

Endosperm has genotype of pollinator and egg producer

Sweet corn must be isolated during production

Sweet Corn

TABLE 15.2. KERNEL CHARACTERISTICS AS AFFECTED BY POLLEN AND KERNEL GENOTYPE INTERACTIONS

	Pollen genotype			
	Su1	*su1*	*se1*	*sh2*
Kernel genotype	Grain corn	Sweet corn		
Su1 Grain corn	Starchy	Starchy	Starchy	Starchy
su1 Sweet corn	Starchy	Sweet	Segregates 1 : 2 : 1	Less starchy
se1 Sweet corn	Starchy	*su1* level of sweetness	Sweet	Starchy
sh2 Sweet corn	Starchy	Starchy	Starchy	Sweet

Sticky Corn

Also known as “waxy maize”

Found in China in 1909

Led to confusion regarding corn center of origin

Due to a single recessive mutation

Kernels produce only amylopectin, no amylose

Important source of industrial starch during WWII

Sticky Corn

Importance and use

Common usage in Asia, Philippines, parts of SA

Cooked and used much the same way as sweet corn (boiled, steamed, or baked on the cob)

Has a very adhesive, sticky texture, less sweet

Grown agronomically for specialty starch production

Sweet Corn

Climate and soils

Warm season, tender crop

Can withstand only light frost at emergence

Requires 55 degrees for germination

Tolerates most soil types

Requires season-long water availability

Sweet Corn

Seed Production

Requires:

- Interplanting of inbred parents
- Topping female parental line
- Isolation from other corn plants (1/8 mi)

Sweet Corn

Stand Establishment

Isolate classes of sweet corn 600 ft from other types

or

Isolate by pollination time – 300 heat units

Planting date scheduled using 3 methods

- Days to harvest
- Heat units
- Plant growth

Sweet Corn

Modern-Intensive Production

Mostly employed for processing corn, some fresh

Exclusive use of hybrid varieties

Production entirely automated except for harvest of fresh corn

Sweet Corn

Modern-Intensive Production

High inputs:

- Irrigation water
- Fertilizers – high use of N
- Insecticides – control of European corn borer, corn earworm, wireworm

Sweet Corn

Market Garden Production

Production of corn for local fresh markets

Exclusive use of hybrid varieties in developed countries

Land race and open-pollinated varieties common in undeveloped countries

Strong ethnic preferences in local markets

Sweet Corn

Subsistence Production

Practiced worldwide, including modern countries

Production for grain and vegetable use

Exclusive us of land race and open-pollinated varieties

Production with little or no automation except possibly ground preparation

Sweet Corn

Subsistence Production

Beginning to employ GMO insect resistance

Commonly used in intercropping systems provides support for vertical systems

Habitat management strategies (trap crops, intercrops, refuges) important for controlling insects, parasitic striga weed

Water management a serious issue

Sweet Corn

Sweet Corn

Sweet Corn

Harvest

Harvest indices

- Dried silks
- Tight husk appearance
- Kernels nearing full color, firm

Processing indices

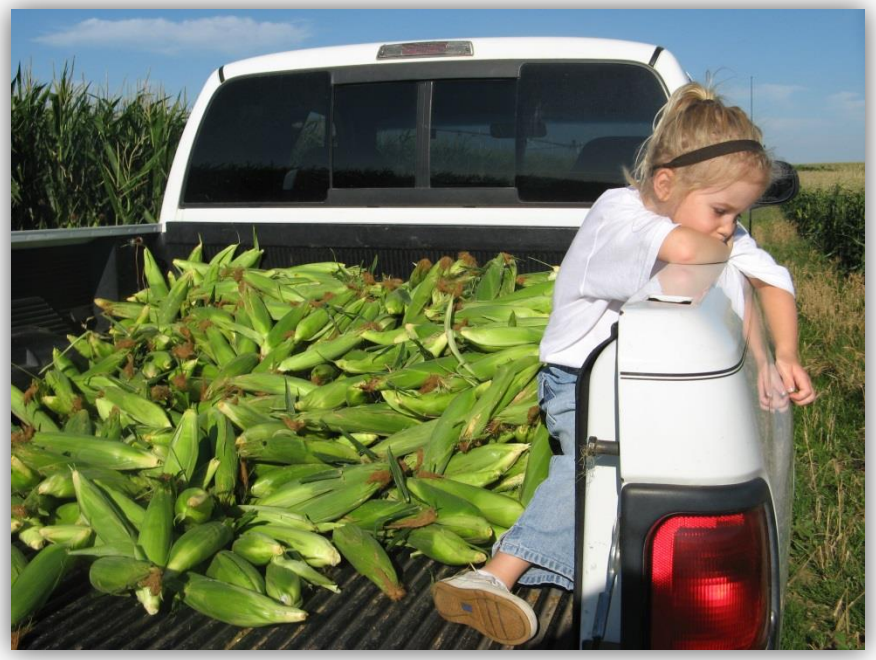
- % solids, % alcohol insoluble solids, % WSP, pericarp test, trimetric test (moisture, pericarp, size)

Sweet Corn

Prediction of Harvest Date

Three methods used:

1. Physiological development
2. Published “Days to harvest”
3. Corn heat units



Sweet Corn

Handling and Storage

Hydrocooled or room cooled to <50 degrees

Handled and shipped at 32 degrees, 90-95% RH

Rapid conversion of sugars to starch

Storage, shipping, shelf life – 6-8 days

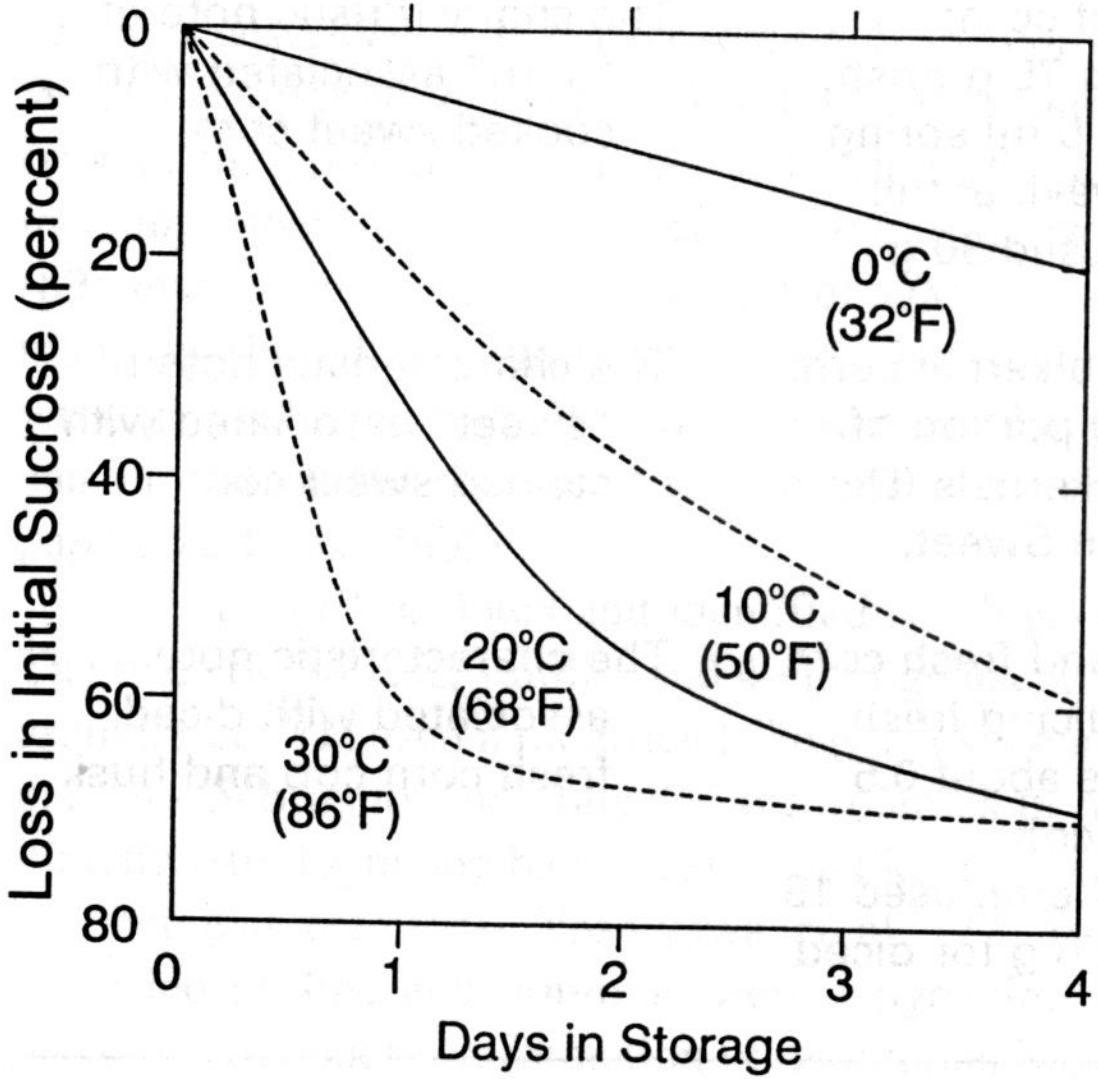


FIGURE 9 Sucrose depletion in sweet corn at four temperatures.

Cactus (Opuntia)

Taxonomy, origin, and domestication

Dicotyledon

Family: Cactaceae

Two genera are important: *Opuntia*, *Nopalea*

Center of origin – probably Mexico

Columbus introduced them into Spain

Spread to Mediterranean and North Africa

Cactus (Opuntia)

Use and production

Gathered, wild-cultured or produced on small farms

Edible portions are the cladodes (pads) and the tuna (fruit)

Cladodes eaten fresh or boiled

Tuna eaten fresh, boiled, made into syrups or jams

Cactus (Opuntia)

Cactus (Opuntia)

Management techniques

Vegetatively propagated using mature cladodes

Some irrigation is used to increase growth rate

Some fertilizer required

- Nitrogen only for cladode production

Harvested by hand, careful cutting at articulation

Can be stored for 3 weeks at 60 degrees if waxed

Cactus (Opuntia)

Bamboo

Bamboo

Origin and domestication

Center of origin in China

Of ancient use for food, timber, paper, other

Most important genera for food:
Phyllostachys, *Bambusa*, *Dendrocalamus*

Bamboo forests in China, Malaysia, Indonesia

Bamboo

Gib's Picks for Edible Shoots:

Bambusa oldhamii - GIANT TIMBER BAMBOO

Phyllostachys dulcis - SWEET SHOOT BAMBOO

Phyllostachys heterocycla pubescens - MOSO BAMBOO, MOSO-CHIKU

Phyllostachys nidularia - BIG NODE BAMBOO

Phyllostachys nuda- NUDE SHEATH BAMBOO

Phyllostachys nuromarginata - RED MARGIN BAMBOO

Bamboo

Use and production

Edible portion is emerging shoots

Occasionally, seed is used as a grain

Consumed boiled, to remove acridity

Have a crisp, mild flavor after boiling

2,000,000 tons eaten each year

Bamboo

Bamboo

Management techniques

Gathered from the wild and cultured in small market-garden productions systems

Propagation by rhizome divisions or seed

Loose mulch placed over rhizomes

New shoots maintained in the dark

Bamboo

Harvest and Storage

Harvested by cutting just above the rhizome

Shoots harvested
continually for 2-3 weeks

Last shoots are allowed to
grow and mature

All growth removed at seasons end

Smoke drying is used to preserve shoots