

# Ethnobotany. Lecture 13

Alexey Shipunov

Minot State University

September 26, 2016



# Outline

- 1 Centers of cultivated plants origin
- 2 Sugar plants
  - Sugars



# Outline

- 1 Centers of cultivated plants origin
- 2 Sugar plants
  - Sugars



# Obesity and Type II diabetes in Polynesians



The American Journal of  
**CLINICAL NUTRITION**

HOME | CURRENT ISSUE | EMAIL ALERTS | ARCHIVES | SUBSCRIPTIONS | SEARCH FOR ARTICLES  
SUBJECT COLLECTIONS | ASN

Copyright © 1991 by The American Society for Clinical Nutrition, Inc

« Previous | Next Article »  
Table of Contents

## Obesity in Samoans and a perspective on its etiology in Polynesians.

ST McGarvey

Author Affiliations

### Abstract

For Samoans, modernization produces obesity and adiposity and concomitant increases in cardiovascular disease risk factors and outcomes. Massive adiposity and high prevalence of obesity characterizes modernizing adult Samoans. Mean body mass index (in kg/m<sup>2</sup>) at ages 25-54 y is 30-32 for males and 32-36 for females. Prevalence of overweight in female adults is 46% in traditional Western Samoans and 80% in migrants in Hawaii. Five-year longitudinal data show striking weight and fat gain, especially in younger adults and females. An evolutionary perspective on Polynesian adiposity is based on scenarios of the fates of sailors on the voyages of discovery and of settlers in the pioneer island villages. Efficient metabolisms producing rapid adipose-tissue growth could have increased survival among the first Polynesians. Rapid dietary and physical activity changes caused by modernization interacting with such population genetic predispositions may lead to the documented massive adiposity.

### This Article

Am J Clin Nutr June 1991  
vol. 53 no. 6 1586S-1594S

» Abstract Free  
Full Text (PDF)

Rent or Purchase Article

Classifications

Journal Article

Services

Email this article to a colleague

Alert me when this article is cited

Alert me if a correction is posted

Article Usage Statistics

Similar articles in this journal

Similar articles in PubMed

Download to citation manager

manager

Purchase a print copy of this issue

Reprints and Permissions

Citing Articles



# Why knowing centers of origin is important

- Allows to trace history of civilizations alongside with history of plant cultivation
- Allows for historical discoveries
- Helps to find new landraces and wild relatives useful for selection

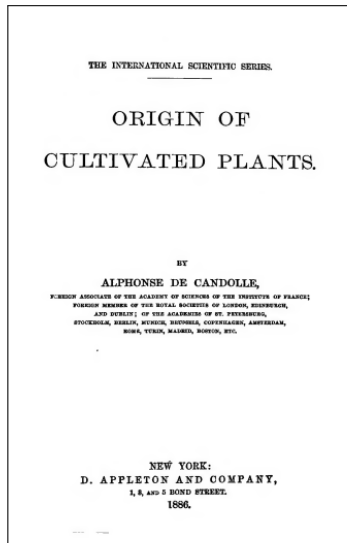


## Initial hypotheses: De Candolle (1882)

- Mentioned that distribution of ancient cultivated plants was very unequal
- Found three centers of plant origin: China, West Asia/Egypt and tropical Asia



# De Candolle's "Origin"



# Nikolai Vavilov work (1926)

- On the 5th International Genetics Congress, he presented his new classification of centers based on field and collection research
- Differential method: studying density of distribution on a level of varieties. Places where biggest densities were intersected become “centers candidates”
- In 1930s, he establishes “passports” of multiple territories which show ecological, economical and geographic traits





# Vavilov's centers (1926)

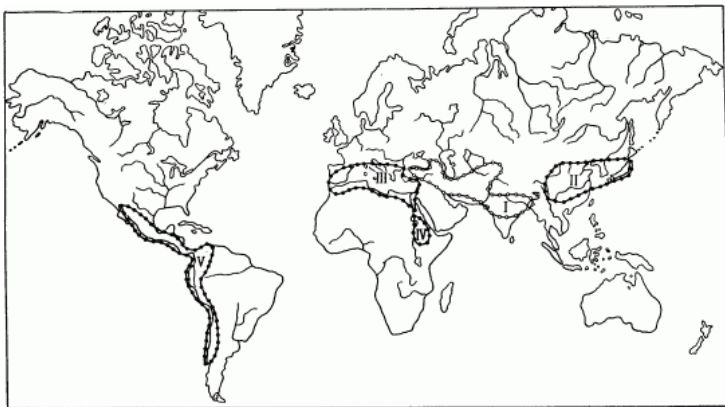
In 1926, he designated five centers of origin:

- 1 India
- 2 China
- 3 Mediterranean region
- 4 Ethiopia
- 5 South and Central America

Later, he added some (Central Asia) and split some of them



# Five Vavilov's centers

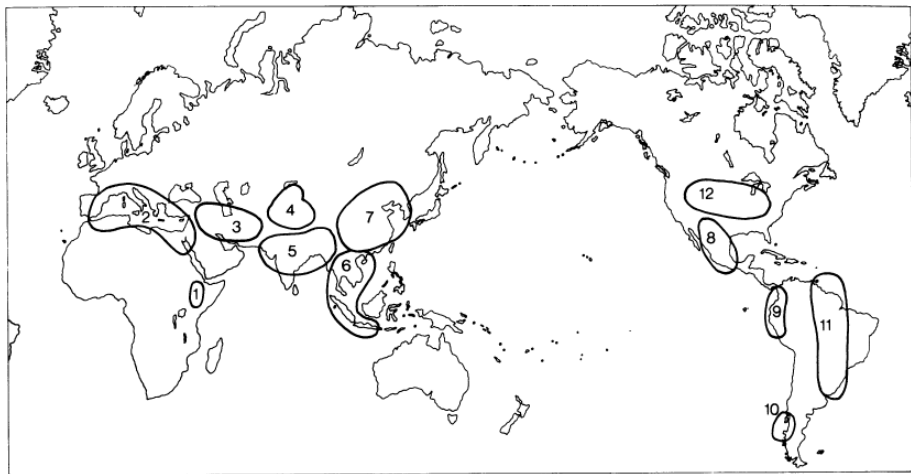


# More recent hypotheses

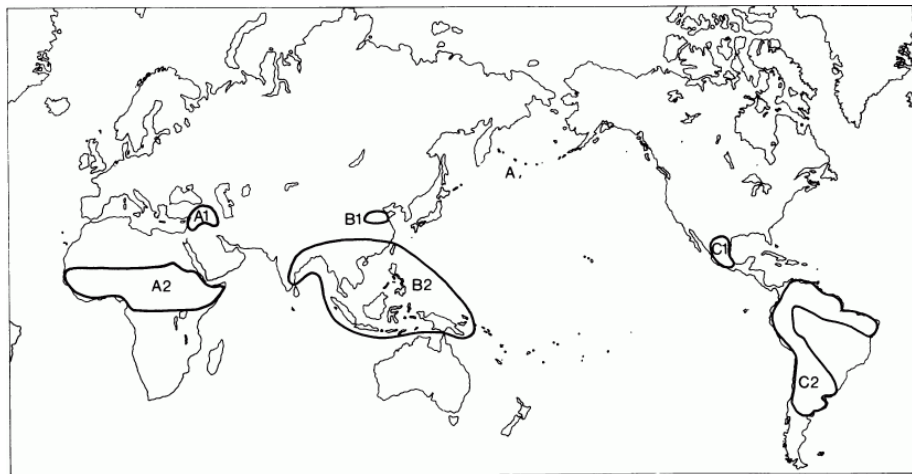
- Darlington (1952): several American centers, twelve centers in total
- Harlan (1971): “centers of agricultural beginnings”: only six
- Zhukovskij (1965–1982): 12 “megacenters” (regions). All Vavilov’s centers listed, plus several which do not produce substantial amounts of cultivated plants but still separate



# Darlington's centers



# Harlan's centers of agricultural beginnings

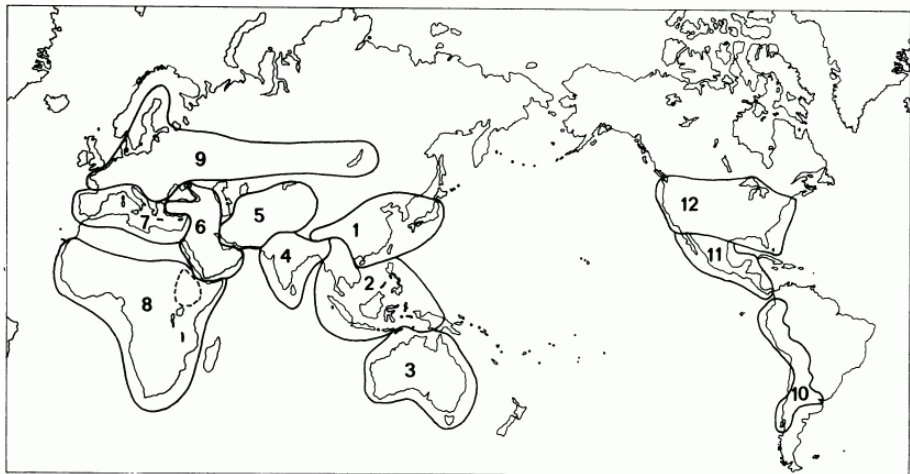


# Centers of origin from Zhukovskij

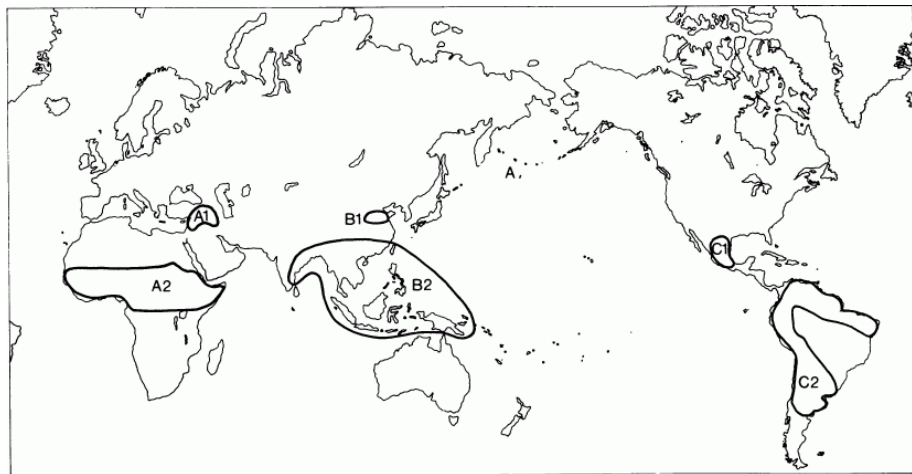
- China
- Indochina—Indonesia
- Australia—New Zealand
- India
- Central Asia
- West Asia
- Mediterranean
- Africa
- Europe—Siberia
- Central America
- Bolivia—Peru—Chile
- North America



## Zhukovskij's regions (centers)



# We will follow Harlan (1971)





# West Asian center (A1)

- Xerophytes, plants relatively small, stiff stems and leaves, drought-tolerant
- Some wheats, two-rowed barley, oats, lentils
- Ancient Egypt and Mesopotamia



## Indian center (B2)

- Xerophytes, small leaves, rapid development and filling-out of seeds, small seeds, extremely susceptible to European fungal and bacterial diseases
- Some wheats, six-rowed barley, finger millet, chickpea
- Ancient Indus Valley Civilization



## African/Ethiopian center (A2)

- Adapted to poor soils, starting to grow in the beginning or in the end of rain season
- Fonio, tef, sorghum, pearl millet
- Ancient African civilizations: Aksum, Yoruba, Benin



# China center (B1)

- Mesophytes and even hydrophytes, short development, small and medium-sized seeds, relatively big leaves
- Rice, soybeans
- Ancient Chinese kingdoms



# Central American center (C1)

- Xerophytes and mesophytes, slow growing, big seeds, drought- and hot-tolerant
- Corn, common bean, sweet potatoes
- Ancient Aztec and Mayan empires



## South American center (C2)

- Mesophytes, many are tolerant to low temperatures, big leaves, developed underground parts
- Cassava, potatoes, oca etc.
- Ancient Andean civilization



# Sugar plants

## Sugars



# Sugars and their role

- Mono- and polysaccharides
- Glucose, fructose, sucrose, cellobiose
- Starch (amylose + amylopectin) and glycogen





# Sugars and civilizations (speculation!)

- High level of glucose uptake by nervous cells
- Increasing use of sugars in human history
- “Unsuccessful” civilizations which did not find a reliable source of sugars



# Ethanol

- Immediate product of yeast fermentation of glucose
- Pre-adaptation to alcohol from frugivores
- Bind to GABA (gamma-aminobutyric acid) receptors
- Converted into acetaldehyde (toxic!) by alcohol dehydrogenase and then into acetic acid by acetaldehyde dehydrogenase
- Asian flush and alcoholism are related to the genetic diversity of alcohol dehydrogenases



# Downsides of sugars

- Obesity, because sugars are easily convert into fats
- Diabetes, because insulin cannot deal with large quantities of sugars
- Dental diseases, especially dental caries (caused by lactobacteria taking sugars for their growth)
- Multiple sweeteners have been developed to avoid side-effects of sugars: heterocyclic saccharine (in “Sweet’N Low”), amino acid derivative aspartame (in “Equal”), chlorine hexose sucralose (in “Splenda”, “Altern”). All are controversial.



# Summary

- According to Harlan (1971), there are 6 centers (regions) of initial plant cultivation
- Sugar is highly used but controversial source of energy



# For Further Reading



A. Shipunov.

*Ethnobotany* [Electronic resource].

2011—onwards.

Mode of access:

[http://ashipunov.info/shipunov/school/biol\\_310](http://ashipunov.info/shipunov/school/biol_310)



P. M. Zhukovskij.

*Cultivated plants and their wild relatives* [Electronic resource].

Commonwealth Agricultural Bureaux, 1962. Abridged translation from Russian.

Mode of access:

[http://ashipunov.info/shipunov/school/biol\\_310/zhukovskij1962\\_cultivated\\_plants.pdf](http://ashipunov.info/shipunov/school/biol_310/zhukovskij1962_cultivated_plants.pdf).

