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## Origins of Cultivated Plants

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Origins of Cultivated Plants  
Ref. Chap. I of Hayes, Immer & Smith

1. Early beliefs:

Cultivated plants were gifts of the Gods.

But those people did not have many of today's important plants so their Gods were not so benevolent! They thought cultivation directly improved plants.

2. The early researchers:

2.1 Decandolle - 1855 and 1882 publications

Traced some species to wild ancestors

Influenced by Linnaeus

Species were relatively unrelated if non-crossable he believed

No knowledge of genetics, cytology, crossing barriers, evolution, etc!

2.2 Darwin - 1868 pub. "Variation of Animals and Plants Under Domestication."

Knew nothing about laws of inheritance.

2.3 Mendel - 1 important paper, 1865 "Investigations of Plant Hybrids."

Thought plants became adapted to changing conditions through the action of the environment (wild or cultivated) upon variable populations the result of natural crossing between varieties and/or species.

Reference: Vol. 13 of Chronica Botanica (Botanical Stories) pub. in Waltham, Mass., 1949. "The Origin, Variation, Immunity, and Breeding of Cultivated Plants." N. I. Vavilov. Trans. by K. Starr Chester.

2.4 Vavilov, Nikolai Ivanovitch

Russia's most distinguished geneticist.

Born 1887, died 1942.

Studied with Bateson in England (Biffen 1st)

Studied geo. dist., origin, and characteristics of cultivated plants in many places.

1920 - 1935 very active in biology.

Clashed with a clever scientist demagogue who was an able physiologist (Lyaenko)

but knew nothing about genetics.

Established the value of vast plant collections for breeding work.

Demonstrated "the law of homologous series in variation" - holds that parallel variations existed in all categories of related plants.

Example - black seeded cereals

dis. res.

oppressed branches

poplar, oak, maple, linden

Centers of origin of cultivated plants

8 centers were apparent

3. Vavilov's centers of origin.

3.1 Chinese - the earliest and largest; consisted of mountains and adjacent

lowlands of central and western China.  
136 species excluding ornamentals.

3.2 Indian center of origin inc. Burma and Assam. 117 species thought to have originated here.

3.3 Indo-Malayan (Indo China and Malay Archipeligo) 55 species

3.4 Central Asia

NW India, Afganistan, part of Russia  
42 species

3.5 Near-eastern center

Iran and NW areas  
83 species

3.6 Mediterranean

84 species

3.7 Abyssinian center

38 species

3.8 Central America and South Mexico

49 species

3.9 South America

Peru, Ecuador, Bolivia  
45 species

3.10 Chiloe (Island west of South America belonging to Chile)

4 species

3.11 Brazil - Paraguay

13 species

3.12 West African

1 specie that I know of

These centers are separated by deserts, mountain ranges, or bodies of water. Of the 640 most important cultivated plants in the world, 500 belong to the old world. Of these, 400 originated in Southern Asia.

3.12.1 Based upon personal investigations and trips and upon knowledge of the work of others.

.2 Centers of origin

3.12.2.1 Chinese

Earliest and largest

Millets

Soybeans

Barley, awnless and hulless

Oats, naked

Radish

Sugarcane

Oranges

Lettuce

Cucumbers

(No. 1 in Thailand)

- |          |  |  |
|----------|--|--|
|          | Buckwheat<br>Plums, prunes, Apricots   | Squash<br>*Peaches   |
| 3.12.2.2 | Hindustan (Burma and Assam)<br>*Rice<br>Cowpea<br><br>Tangerine  | Egg Plant<br>*Some cotton<br>species<br>Citron                             |
| 3.12.2.3 | Central Asiatic which includes Punjab, Kishmir<br>Afghanistan and northward.<br>*Common wheat<br>English peas<br>*G. herbaceum<br>Cantaloupes Carrots Spinach<br>Garlic Pears Almonds<br>Apples Chick peas | Lentils Sesame<br>Flac Hemp  |
| 3.12.2.4 | Near Eastern consisting of Iran, Asia Minor (most<br>Turkey and some adjacent land)<br>Einkorn (and 8 other species)<br>2-row barley<br>Rye<br>Common oats<br>Red oats<br>Alfalfa<br>Vetch                 | Fig Cherry<br>English Walnut<br>Filberts chestnuts<br>Hazel nuts<br>Apples |
| 3.12.2.5 | Mediterranean<br>Durum, emmer, and spelt<br>wheats<br><br>Some oats and barley species<br>Hops beets onion chives<br>etc leek lettuce<br>Flax  | Ranks with China<br>as source of vegeta-<br>bles.                          |
| 3.12.2.6 | Abyssinian<br>Common 6-row barley lentils 6-row barley<br>Durum wheat chick pea more diverse here<br>Grain sorghum castor bean than anywhere<br>Coffee Okra else.  |  |
| 3.12.2.7 | South Mexican and Central America<br>*Corn<br>Beans, Lima and others<br>Sweet potato<br>*Upland cotton, <u>G. hirsutum</u>   | Cacao<br>Papaya<br>Avacado<br>Squash                                       |

3.12.2.8 South America  
 Irish potatoes                      peanuts  
 Lupines                                Hevea (rubber)  
G. barbadense                      Pineapple  
 \*Tomato                                Cashew  
 Quinine  
 \*Tobacco

3.12.2.9 North America  
 Sunflower, Blueberries, Cranberries, Currents,  
 Gooseberries.

3.12.3 Evolution by cultivation (Darlington and Janaki Annual)  
 pp. 18 - 23

- A. Tillage conditions
- B. Sowing conditions
- C. Harvesting conditions
  - 1. Replacement of a crop by its own weeds
  - 2. Secondary uses follow primary use
- D. Conditions of fertilization
  - 1. Inbreeding replaces outbreeding
  - 2. Outbreeding replaces inbreeding
- E. Secondary changes

The Law of  
 Comparable Series of Variants in  
 Rather Closely Related Species  
 (or The Law of Homologous Series)

1. Discovered by Vavilov and co-workers  
 Published in 1922.  
 Same thing was commented on by Darwin about 1870.  
 Same thing was commented on by Walsh, 1863.

2. Example:  
 Oat species all have: same seed color types  
                                   hairy vs. glabrous glumes  
                                   spring and winter types

Cotton Species:  
 fiber colors - white, brown, green  
 hairs, present or absent  
 seed color  
 leaf form

Diciduous trees:  
 Appressed branching  
     Poplars            Maple  
     Oak                Linden

Wheat and rye have same kind of variants

Related genera also show parallel variation

Hulled and hulless oats, wheat, barley, corn, millet

Suggests monophyletic origin of plants.

This information helps the plant breeder by assuring him that if he searches he may find a needed variant if it has been observed in species related to the one he wishes to improve.

The definite regularity in plant life and animal life is what one would expect from the nature of the evolutionary process.