

Subject: Botany, Class: M. Sc. Semester IV, MBOTEC-I, Cytogenetics and Crop Improvement, Topic: Centres of Origin of Crop Plants.

The centre of origin is a geographical area where the particular group of organisms (either domesticated or wild) first originated on earth. Many people believed that centres of origin are also centres of diversity. But, the centres of diversity may not represent the centres of origin of crop plants. Although a few species may have been originated separately at more than one place, but most species had their origin at a certain place and then spread elsewhere. In other words, in the centre of origin a crop is generally confined to one place, whereas the centre of diversity may be found at more than one place. The exact location of origin of species is only a matter of speculation based on indirect evidences.

The information on origin of crop plants is important in plant breeding to locate wild relatives, related species and new genes. Knowledge of the origins of crop plants is important to avoid genetic erosion, the loss of germplasm due to the loss of ecotypes and habitat. The Russian scientist Nikolai Ivanovich Vavilov and his colleagues visited several countries and collected a large number of crop plants and their wild relatives. They used this collection in Russian breeding programme of developing improved varieties. His deductions were based on evidences from morphology, anatomy, cytology, genetics, plant geography and distribution. He considered that great centres of origin were always located in lower mountains and hills of tropical, sub-tropical regions. He also recognizes some secondary centres of origin where two or more species crossed together. Secondary centres of origin are the places where natural and artificial selection occurred one after another. He stated that plants were not domesticated at random but it was a continuous process.

Vavilov's centers of origin

He published his results in 1926 and developed a theory on the centres of origin of cultivated plants. He proposed 8 centres of origin of crop plants,

1. Chinese centre: It is considered to be one of the earliest and largest independent centres of origin of cultivated plants. This centre includes mountain regions of central and western China. A total of 136 endemic plants are listed, among which are a few known to us as important crops. The endemic species listed from this centre include Soya bean, radish, Turnip, Pear, Peach, Plum, Colocasia, Buckwheat, opium poppy, brinjal, apricots, oranges, china tea etc.

2. Himalayan centre: It also known as the Indian centre of origin. This centre includes regions of Assam, Burma, Indo-china and Malayan Archipelago. This area has two subcenters:

A. Main Center (Hindustan): Includes Assam and Burma, but not Northwest India, Punjab, nor Northwest Frontier Provinces. In this area, 117 plants were considered to be endemic.

B. Indo-Malayan Center: Includes Indo-China and the Malay Archipelago. Fifty-five plants were listed in this centre. The endemic species listed from this centre include Rice, red gram, chick pea, cow pea, Mung dal, brinjal, cucumber, sugar cane, black pepper, Moth bean, rice bean, cotton, turmeric, indigo, millets etc.

3. Mediterranean centre: This centre includes borders of Mediterranean Sea. Most of the cultivated vegetables have their origin in this region. Eighty-four plants are listed for this region including olive and many cultivated vegetables and forages. The endemic species listed from this centre include Durum wheat, emmer wheat, oat, barley, lentil, pea, grass pea, broad bean, cabbage, asparagus, pepper mint etc.

4. Abyssinian centre: This region includes Ethiopia and parts of Somalia. In this center were listed 38 species. The endemic species listed from this centre include Wheat, sorghum, bajra, safflower, castor, broad bean, okra, coffee etc.

5. Central Asian centre: This centre includes north-west India, Afghanistan, Uzbekistan and western China. Forty-three plants are listed for this center, including many wheats. The endemic species listed from this centre include Bread wheat, club wheat, sesame, linseed, muskmelon, carrot, onion, garlic, apricot, grape, hemp, cotton etc.

6. Asia minor centre: This centre covers near East Asian regions like Iran and Turkmenistan. Eighty-three species including nine species of wheat were located in this region. The endemic species listed from this centre include Wheat, rye, Pomegranate, Almond, Fig, Cherry, Walnut, Alfa Alfa, Persian clover etc.

New world

7. Central American centre: This centre includes southern parts of Mexico, Costa Rica, Guatemala and Honduras region. The endemic species listed from this centre include Maize, rajma, lima bean, melon, pumpkin, sweet potato, arrow root, chilly, cotton, papaya, guava, avocado etc.

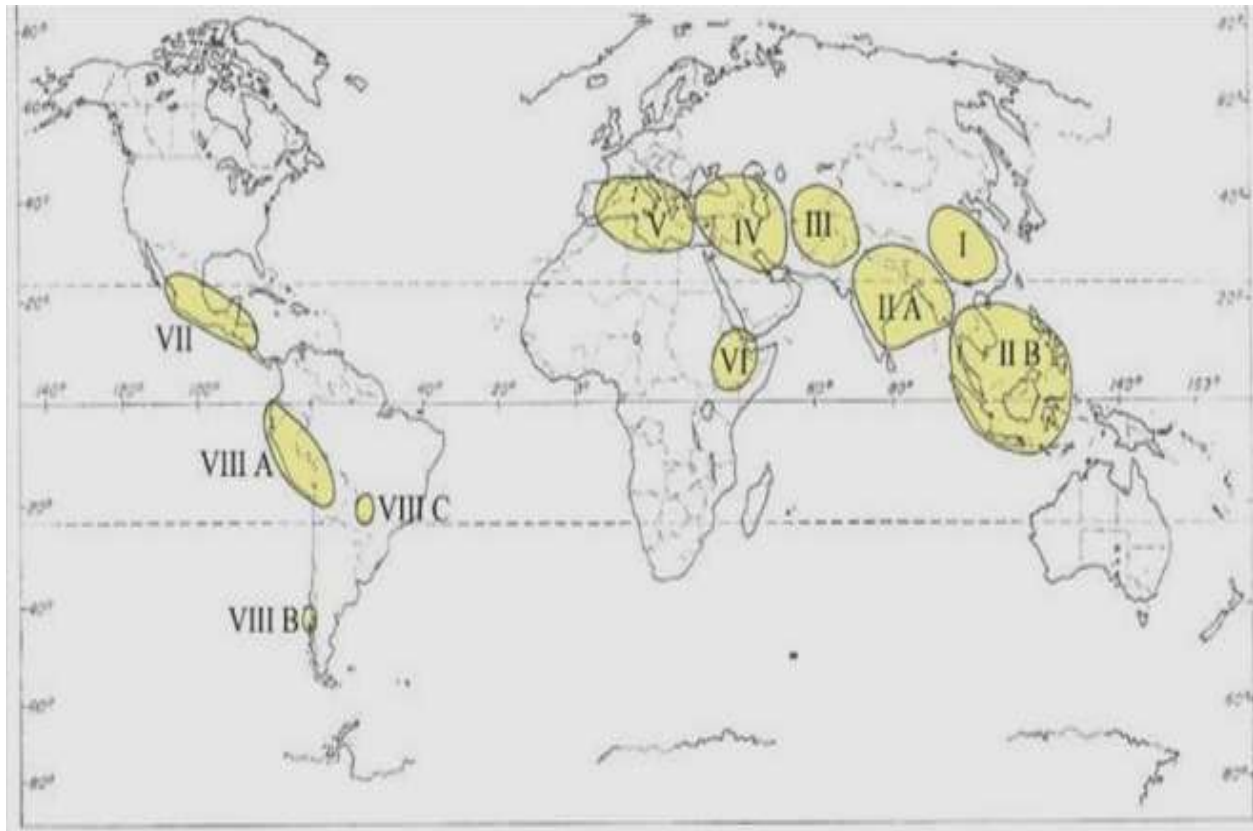
8. South American centre: This centre includes Peruvian regions, islands of southern Chile, Brazil and Paraguay regions. 62 plants listed and three subcenters are found.

A. Peruvian, Ecuadorean, Bolivian Center: Comprised mainly of the high mountainous areas, formerly the center of the Megalithic or Pre-Inca civilization.

B. Chiloe Center (Island near the coast of southern Chile).

C. Brazilian-Paraguayan Center.

The endemic species listed from this centre include Potato, sweet potato, lima bean, tomato, papaya, tobacco, quinine, cassava, rubber, Ground nut, Cocoa, pineapple etc.



Vavilovian Centres of Origin for crop plants

Limitations of Vavilov's views

The expansion of our understanding on cultivated plants pointed certain limitations on Vavilov's views. These views require some modifications,

Vavilov considered the region with greatest genetic diversity of a species as the centre of origin of that species. But now, many such species are known whose centres of origin and genetic diversity are different. For example, maize and tomato.

The centres of origin of cultivated plants as per Vavilov are limited to the mountains and small hills in tropical and sub-tropical regions. But recent evidences also suggest plains as the centres of origin of many cultivated plants.

Today several crops are known whose centres of origin are different from the ones suggested by Vavilov. Moreover there is more than one centre of origin. Also, the origin of many of the species cannot be traced due to lack of sufficient evidence.

According to Vavilov primary centre is marked by high frequency of dominant alleles towards the centre and recessive towards the periphery. But this view is not acceptable as per the latest knowledge.