ERASMUS+ Programı Yükseköğretim Alanı Yenilik ve İyi Uygulamaların Değişimi İçin Stratejik Ortaklık Projeleri (KA203)

PROJE NO: 2019-1-TR01-KA203-075715

TARIMSAL MİRAS (AGROHERITAGE)

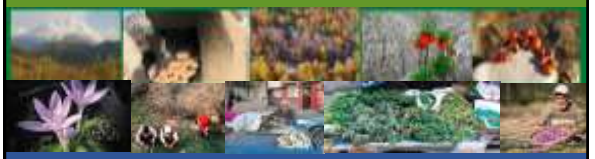
2.2 Bitkilerin Kültüre Alınması

(2.2 Domestication of Plants)

ANLATICI
Alptekin Karagöz

Bu proje, ERASMUS+ Programı kapsamında Avrupa Komisyonu tarafından desteklenmektedir. Ancak burada yer alan görüşlerden Avrupa Komisyonu ve Türkiye Ulusal Ajansı sorumlu tutulamaz.

Origin of Agriculture and Domestication of Plants



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2021

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Human existed in the World for 2.000.000 yrs

For over 99% of this period human was hunter-gatherer

80.000.000.000 human have ever lived out of this span

- Over 90% of them were hunter-gatherers
- 6% were agricultural communities
- 4% are industrial communities.

Agriculture is quite a new practise for human being.

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What do the gatherers eat?

Grass seeds (ca. 60 spp.)

Legumes (ca. 50 spp.)

Root tubers (ca. 90 spp.)

Oil seeds (ca. 60 spp.)

Fruits and nuts (ca. 500 spp.)

Vegetables and spices (> 600 spp.)

1.410 species

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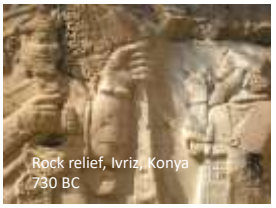
In the history of Anatolia, Rome, Greece, Mexico, Egypt, China, African communities, N. American Indians, Peru, Azteks, …….. Agriculture is of divine origin. In Turkey we respect our food and refrain from dropping them on the ground. Wherever we find a piece of bread on the ground we kiss and remove it.

It is quite likely that religion and religious rituals are among the driving forces in domestication of plants as in the case of animals.

Peganum harmala



Even today cereal harvest and vintage are celebrated with special ceremonies.

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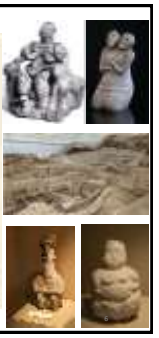
Plant remains from the Near East and Greece (Hawkes, 1983)



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Plant remains from several excavations in Turkey

Date (BC)	Sites	Remains
7500	Aşıklı Höyük	Einkorn, emmer, durum wheat, barley, lentil, bitter vetch, pea, chick pea
7200–6500	Çayönü	Wild einkorn, wild emmer, wild barley, cultivated einkorn and emmer, pea, lentil, vetch, lint
6750	Hacılar	Wild einkorn, cultivated emmer
6500	Can Hasan	Wild einkorn, cultivated einkorn, cultivated emmer, barley (2 row), lentil, vetch.
6000–5000	Çatal Höyük	Cultivated einkorn, emmer, wheat, barley (naked), pea, vetch
6000–5000	Erbaba	Cultivated einkorn, emmer, wheat, barley (2 row and naked), pea, lentil, vetch

DEFINITIONS

What is a CROP?

The word "CROP" has several meanings.

- the material that is **cut, mowed, grazed**, etc.
- the material that is harvested (this includes all the harvested material including cereals, fruits, calf or lamb, timber, hunted wild animals and aquatic material etc.)

Since the term "**crop**" has a broad meaning covering **every harvested item** regardless of its status whether wild or domesticated, we need to define the terms "**wild**", "**cultivated**" and "**domesticated**" as well.

The terms *cultivated* and *domesticated* are often used synonymously but actually they have quite different meanings

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The words "**domestication**" and "to domesticate" are derived from the Latin ***domus***, which means house, household, dwelling.

Domestication means, to bring someone / living organism into the household.

A domesticated plant or animal is one that has been brought into the household and serves those who also live there.

The household has a broad meaning including field, barn, stable, the home garden, orchard …..

Domestication involves genetic changes that adapt the plant or animal to the *domus*, and full domestication results in populations that cannot survive without the aid of man.

Together with domestication process, human being has also began to be domesicated and co evaluated.

and

Both human and domesticated organisms depended upon each other.

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Some of the modifications taking place during plant domestication

- **Competition ability (less competitive)**
- **Size (depends)**
- **Morphological difference (easier to handle)**
- **Physiological adaptation differences (anatomy and physiology)**
- **Seed propagation mechanism (easier to harvest)**
- **Protective mechanisms (weaker)**
- **Seed viability and production (uniform and abundant)**
- **Growth habit (depends, generally upright)**
- **Germinability and germination uniformity (unifort growth & harvest)**
- **Reproductive mechanism (more autogamus)**
- **Color, fragrance, aroma, taste (depends)**
- **Adaptation to changing conditions (weak if not none)**
- **……**

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GENERALLY SPEAKING

domestication involves genetic changes that adapt the plant or animal to the *domus*,

and

full domestication results in populations that cannot survive without the aid of man (*vice versa*)

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What is CULTIVATION?


Harvest toolsfrom Asiklihöyük, (Aksaray Museum)

Cultivation means, conducting agronomic practises such as tilling the soil, preparing a seedbed, weeding, pruning, protecting, irrigating, spreying and manuring for vegetal production.

Cultivation is concerned with human activities while domestication deals with the genetic response of plants cultivated.

It is therefore quite possible to cultivate wild plants, and cultivated plants are not necessarily be domesticated.

What is WILD?

Several definitions are available:

- A herbaceous plant, not valued for use or beauty, growing wild and rank, and regarded as cumbering the ground or hindering the growth of superior vegetation (Harlan, 1992)
- a plant that is not valued where it is growing and is usually of vigorous growth (M. Webster, 2020)
- one that tends to overgrow or choke out more desirable plants (M. Webster, 2020)


Scolymus hipsnaicus (golden thistle)


Silybum marianum (Marian thissle)

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More definitions

- A plant out of place, or growing where it is not wanted (Blatchley, 1912)
- A plant growing where we don't want it (Salisbury, 1961)
- A plant whose virtues have not yet been discovered (Emerson, 1912)
- Pioneers of secondary succession (Bunting, 1960)
- Biologically speaking, weeds are plants that build up associations with useful plants and for which cultivation is beneficial even necessary. Agriculturally speaking, weeds grow unwanted in cultivated land and there cause more harm than good (Rademacher, 1948)
- A generally unwanted organism that thrives in habitats disturbed by man (Harlan, deWet, 1965)

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Many of the definitions imply that weeds are the plants growing at wrong places. However, the "**wrong place**" concept is a human perception which is not inherent in the nature.

As a matter of fact, it is the human being who is at the wrong place, not the weeds.


Mespilus germanica (common medlar)

***Homo sapiens* is perhaps the weediest of all species, and the more he dominates the landscape (Harlan, 1992)**


Elaeagnus angustifolia (oleaster)

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Chestnut (wild)


Chestnut (cultivated)


Some of wild wheat relatives


Cultivated wheat

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Proposed models for plant domestication

Domestication for religious reasons

There are a number of plants, wild and cultivated, used for ritual, ceremonial, and magical purposes. Some are drug plants, some produce dyes and some have colorful leaves or flowers. Many narcotic and hallucinogenic plants have been used in religious ceremony and ritual. This, of course does not mean that drug and ritual plants were domesticated before food plants, but it would not be wise in dealing with human affairs to ignore the motivations of religious concern.

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Proposed models for plant domestication

Domestication by crowding and stress

It was argued that agriculture was adopted as a result of stress brought on by an increase in population and depletion of the foraging ranges. On the other hand, climates of North Africa and parts of the Near East had become increasingly desiccated over a long period of several millennia BC. Rangelands dried up, animals and man to withdraw to areas where water was available year long. There they began to domesticate animals first, then the plants.

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Proposed models for plant domestication

Domestication as extension of plant gathering

Populations of hunter-gatherers were well below the carrying capacity of the resources. So environment did not exert pressure on man to change his food procurement systems.

But for those who were involved in farming it is the end product of a long period of adaptive coevolution of gathered plants and human. The processes sometimes took millennia and were often spread over regions some thousands of kilometers across.

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Proposed models for plant domestication

Domestication as a result of discovery of cultivation

Darvin proposed (1896) for agricultural origins that cultivation was an invention or discovery. The savage inhabitants of each land, found out by many and hard trials that plants could be more useful when they were subject to various cooking processes. It was the first step towards plant domestication.

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Proposed models for plant domestication

No-model model for domestication

The no-model model is proposed by Harlan (1992). After the plants gathered by the inhabitants of a certain area, plant remains and all the dump were scattered around their settlements. Some of the seeds began to flourish on those dump heaps and populations of collected plants began to multiply there. Some of the genotypes are believed to originate from dump heap weeds. Some crops were derived from weeds and some weeds were derived from crops. It is the crop-weed complex in which both crop and weed are derived from the same progenitors.

The Gene Centers Theory of Vavilov partly depends on this assumption.

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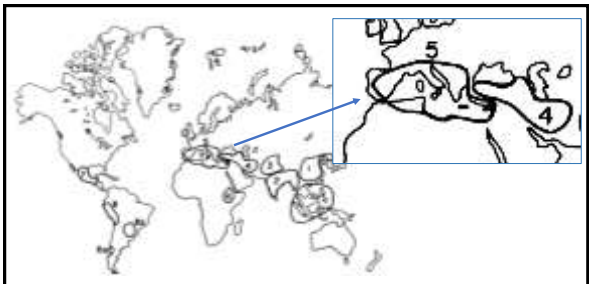

The eight centers of origin, according to Vavilov (Harlan, 1992)

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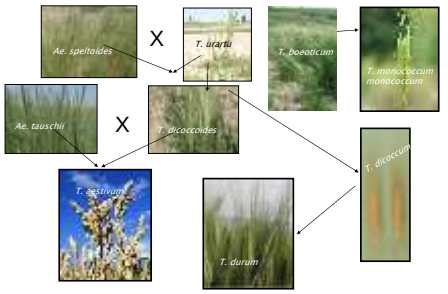
EVOLUTION OF WHEAT



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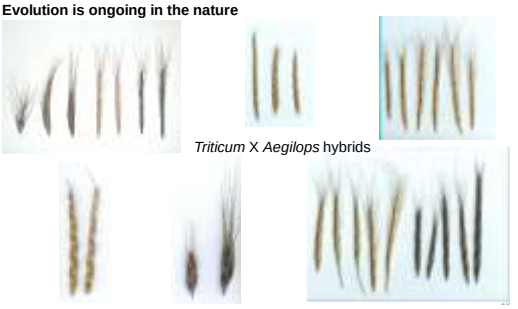
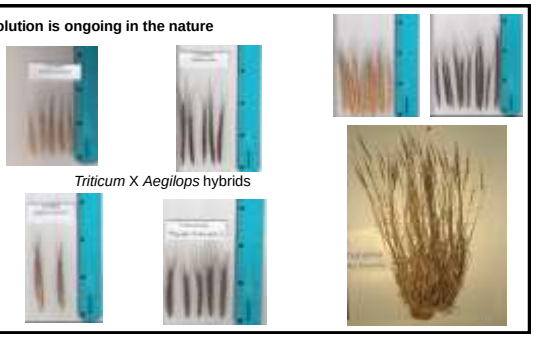
Evolution is ongoing in the nature



Triticum X *Aegilops* hybrids

22

Evolution is ongoing in the nature



Triticum X *Aegilops* hybrids

Evolution is ongoing in the nature

Spontaneous hybrids of *Aegilops X Triticum* at the field edges (Şanlıurfa).

Evolution is ongoing in the cultivated material

T. dicoccoides population in *T. durum* field (Kahramanmaras, Turkey)

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Plants feding the World today

There are 400.000 identified plant species in the world

ca. 30.000 are edible

ca. 6.000 are consumed as food

150 plant species are mainly consumed in the world. Among them

Maize

Wheat

Rice

meet **60%** of the daily calorie needs of the world's population

FAO Commission on Genetic Resources for Food and Agriculture

2019

Благодаря ти

Ευχαριστώ

Хвала вам

Teşekkür ederim

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