

Glossary

As was discussed in several lessons, the conservation of a given species involves not only the conservation of its physical seed (sexual or vegetative) but also of its genetic resources. The field of genetic resources is relatively new, and includes several disciplines, each with its own, frequently unfamiliar, jargon. Because no specialized glossaries are readily available on the subject of plant genetic resources, we compiled this glossary for the convenience of the course students. We added other terms related to genetic resources but not used in the course because they may appear in the reading of the bibliographies provided.

A

Abiotic

(*adj.*) related to physical and chemical factors of the environment such as water, temperature, and soil.

Accession or entry

(**a**) A sample of a plant, line, or population maintained in a germplasm bank or breeding programme for conservation and use. (**b**) A sample of germplasm that represents the genetic variation of a population.

Acclimatization

(**a**) The adaptation of an individual to a different climate. (**b**) In a broader sense, the adjustment of a species or population to a new environment, that is, a new habitat, after several generations.

Active collection

a group of germplasm samples or accessions stored for the short to medium term and maintained for the purposes of study, distribution, or use. (See also Base collection; Core collection; Working collection.)

Adventitious

(*adj.*) (**a**) accidental, for example, said of a plant that is not native to the targeted site, but is introduced accidentally by humans. (**b**) In plants, said of structures that develop in unusual places, for example, roots growing on stems, leaves, or old roots.

AFLP or amplified fragment length polymorphism

the polymorphism of a length of an amplified fragment of DNA.

Afrotropic

a biogeographical region, which spans several habitat types, but has strong biogeographic affinities, particularly at taxonomic levels higher than the species level. The region includes Africa south of the Sahara Desert, part of the Arabian Peninsula, and includes neighbouring islands such as Madagascar in the western Indian Ocean. (See also Neotropics.)

Agamic reproduction

see Vegetative propagation.

Agriculture (*adj.* **agricultural**)

the science or practice of cultivating the soil to raise crops and/or rearing animals.

Agrobacterium

a genus of soil bacteria that introduces genes into certain plants through their plasmids.

Albumen

see Endosperm.

Allele

(**a**) Each of two forms of a gene present in the same place (locus) in a pair of homologous chromosomes. (**b**) One of the alternative states of the same gene.

Allelomorph

(**a**) The characteristic specified by an allele. (**b**) Formerly, also used for allele.

Alloenzymes

isoenzymes whose variants are coded by different alleles at the same locus. Alloenzymes are also allelic and, as a result, are ideal for studying populations.

Allogamy

cross-fertilization in plants. **Allogamous** plants are those plants that preferentially cross-pollinate.

Allopolyploidy (*adj.* **allopolyploid**)

a condition whereby an organism has more than two sets of chromosomes in their cells, with each set coming from a different species.

Altitudinal transect

an imaginary line that is traced from a point in a mountain range to sea level. It is used to study altitudinal variations among plant communities.

Amino acids

organic molecules that contain amino and carboxyl groups. They are protein monomers. An enormous variety of proteins exist because of the large number of combinations and lengths.

Amplified fragment length polymorphism

see AFLP.

Aneuploid

an individual that has a chromosome number that is not an exact multiple of the haploid chromosome complement. (*See also Ploidy level.*)

Anfiploid or anfidiplloid

an individual that originates from hybridization between species and possesses the total chromosome complement of the parental species. It is usually produced by the duplication of the chromosome number of the F₁ plant hybrid.

Angiosperms or Angiospermae

a taxon of plants, whose principal characteristic is that they present true flowers. Angiosperms are divided into monocotyledons and dicotyledons.

Annual

a plant that takes one year or less to complete its life cycle and produce seeds.
(See also Biennial; Perennial.)

Anther

in flowers, that part of the stamen that contains pollen.

Anthesis

in flowers, the dehiscence of anthers, when pollen is dispersed.

Anthropic

(*adj.*) having an origin or resulting from human activity.

Antibiotic: *literally*, life destroyer. This term includes all antimicrobial substances, regardless of origin, whether derived from micro-organisms (e.g., bacteria and fungi), synthetic chemical products, or genetic engineering.

Antibody

a defence substance (protein) synthesized by the immune system of an animal organism in response to the presence of a foreign protein (antigen), which it then neutralizes. Plants are a significant source of substances with which to manufacture drugs having antibody characteristics.

Apetalous flower

a flower with no petals.

Apomixis

a phenomenon whereby asexual reproduction occurs instead of normal reproduction through reduction division and fertilization. It is common in some plant species where embryos do not result from meiosis and fertilization, but from certain asexual processes. Seedlings produced in such a way are called **apomictic**. Those plants that reproduce only through apomictic embryos are known as **obligate apomictics**, and those whose embryos are either sexual or apomictic are designated as **facultative apomictics**.
(See also Vegetative propagation.)

Arboretum (*pl. arboreta*)

a garden where trees and shrubs are cultivated for study and display.

Asexual reproduction

see Vegetative propagation.

At risk

see Endangered.

Autochthonous

see Endemism.

Autogamy

in plants, self-fertilization. **Autogamous** plants are preferentially self-pollinated.

Autopolyploid or autopoloid

an organism whose somatic cells carry more than two sets of chromosomes, with all sets coming from parents of the same species.

Autotrophs

see Primary producers.

B

Bank

(a) The place where a collection or collections are held. (b) The socio-economic-political entity responsible for the safe-keeping of a collection or series of collections. (See also DNA library; Germplasm bank.)

Base collection

the widest and most complete collection of germplasm accessions. It is stored over long periods, for conservation purposes. It is used only to fill gaps in the active collection. (See also Core collection; Working collection.)

Basic seed

produced from seed developed by the plant breeder and so managed that the original genetic identity and purity of a given variety is faithfully conserved. The production of basic seed is carefully supervised or used by the representatives of an agricultural experiment station. Basic seed is the starting point for obtaining certified seed, either directly or through registered seed.

Biennial

a plant living for two years and fruiting only in the second. (See also Annual; Perennial.)

Biochemical markers

various isoenzymes that catalyze the substrate itself or other enzymes and which are used to evaluate the enzymatic heterogeneity of plants, that is, the genetic variability between individuals at the level of enzymes and proteins. They indirectly evaluate the genome, based on their enzymatic products, and are susceptible to the environment.

Biodiversity or biological diversity

the set of all plant and animal species in a given region, including their genetic materials and the ecosystems of which they are part.

Biological containers

containers designed as protection mechanisms in the use of organisms in genetic engineering applications. Their purpose is to minimize the 'ability' of organisms used to survive, persist, and self-replicate. The process is also known as 'genetic weakening' and leads to 'engineeringly' diminished organisms.

Biological diversity

see Biodiversity.

Biological heritage

that group of living things belonging to a given geographical area, and which are or could be of economic, biological, or social value for the human communities that live in that area. Commonly spoken of as the 'national patrimony of biological resources', it implies those living things that belong and would have potential value for a given country.

Biology

the science that deals with the study of living things and vital phenomena in all their aspects.

Biomass and ecosystem productivity

(a) The biomass of an ecosystem is the mass of all organisms that constitute the biocoenosis (i.e., community of organisms inhabiting a particular biotope). **(b)** It can also be defined as the chemical energy stored in such a mass. It may be expressed in grams per fresh weight, grams per dry weight, grams of carbon, or calories per unit volume or surface. (See also Productivity.)

Biome

see Ecological region.

Biometry

the science that deals with the application of statistical methods to biological problems.

Biomolecules

formerly called **immediate principles**, these are the basic architectural elements of living things. Inorganic biomolecules are, above all, water, mineral salts, and gases such as oxygen and carbon dioxide. The four groups of organic compounds, exclusive to living things, are carbohydrates, lipids, proteins, and nucleic acids.

Biotechnology

that set of technological applications that use biological systems and live organisms or their derivatives to create or modify products or processes for particular uses.

Biotic

(*adj.*) **(a)** Related to live organisms and organic components of the biosphere. **(b)** In agriculture, a biotic factor or agent is frequently associated with three important groups that affect crop yield: pests (including nematodes), diseases, and weeds.

Biotype

a population in which all individuals have an identical genotype.

Bofedal

a Spanish term referring to a type of wet meadowlands made swampy from underground water seepage and found in Andean high plains. The botanical communities are composed mainly of plants from the *Cyperaceae* and *Juncaceae* families, often of compact or cushiony growth. (See also Bog.)

Bog

a plant community that develops an organic substrate, with hydric saturation, in environments of high precipitation and low temperatures. Two principal types of bogs are recognized: those that constitute mainly mosses, and those that are dominated by *Cyperaceae* and *Juncaceae*. (See also Bofedal.)

Breeder's collection

see Working collection.

Breeding seed

seed (or vegetative planting material) produced by the plant breeder or sponsoring institution from the original form and used to produce basic seed.

Bryophytes

a taxonomic category of plants that corresponds to mosses. The principal characteristic of these ancient plants is the absence of the corm or true stem. They do not have roots and reproduce by spores.

Bulb

a specialized underground organ that consists of an axial stem that is short, fleshy, usually vertical. It carries in its apex a meristem or floral primordium that is covered by thick and fleshy scales.

C**Callus**

the initial tissue formed by the cellular division of explants. It is usually uniform, not having been differentiated into organized tissues.

Carbohydrates

organic biomolecules formed by polyalcohols with an aldehyde or ketone group. They owe their name to their empirical formula, which is $C_x(H_2O)_y$, although some compounds may differ slightly from this general formula. They include glucosides (yielding sugars), glycosides, glycols, and sugars. They carry out the energy, plastic, or structural functions of cellular structures, and store information that determine cellular identity.

Categories of species conservation

international experience suggests that we cannot set a population number or a minimum surface of habitat to delimit each category for determining the degree to which a taxon is in danger of extinction. Consensus and the criteria of specialists in flora and fauna should be used to set the conservation status of each taxon. (See also Endangered; Extinct in the wild; Indeterminate threat; Insufficiently known; Out of danger; Rare; Vulnerable.)

Cell

the structural and functional unit of plants and animals that typically consists of a mass of cytoplasm that encloses a nucleus (except in prokaryotes) and is bound by a membrane that is differentially permeable. It is the simplest unit of life that reproduces by division. Normally, each cell contains genetic material in the form of DNA incorporated into a cellular nucleus, which splits as the cell divides. Higher organisms contain large quantities of interdependent cells. Even so, these can be treated as independently as free cells in appropriate culture media.

Certified seed

the progeny of basic seed, which is produced and used in such a way that it maintains a satisfactory level of purity and genetic identity. It has been approved and certified by an official agency for certification.

Cespitose plants

grass species or perennial graminoids that form mats or tufts, or grow very closely together to cover the ground as lawns.

Character or characteristic

see Trait.

Characterization

the measurement or evaluation of the presence, absence, or degree of specificity of traits whose expression is little modified by the environment.

Chimaera or mosaic

(a) An interspecific hybrid. (b) An organism whose tissues are of two or more genetically distinct classes. (c) An individual that presents two or more genetically different cell lines as a consequence of an anomaly in the first mitosis of the zygote.

Chromatid

one of two filamentous structures that form in the duplication of a chromosome to form other chromosomes.

Chromosome

an elongated intracellular organelle found in the nucleus and consisting of DNA associated with proteins. It constitutes a linear series of functional units known as genes, which conserve their individuality from one cell generation to the next. The chromosome number is typically constant in any given species.

Chromosome number

the usual constant number of chromosomes in a somatic cell that is characteristic of a particular species.

CITES

Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Cleistogamy

pollination and fertilization within a closed flower.

Clonal multiplication

see Vegetative propagation.

Clone

(a) A group of plants that originate from the vegetative propagation of a single plant. (b) A population of cells or organisms of identical genotype. (c) A group of cells or organisms with identical genetic constitution and background and which are derived through binary division or asexual reproduction. (d) A population of recombinant DNA molecules with the same sequence.

Cloned gene

a gene copied from an initial gene. It is inserted into a molecular vector through in vitro recombination techniques.

Co-evolution

(a) The joint evolution of two or more organisms that are interrelated either positively or negatively. (b) Any situation in which two organisms act as selective agents on each other, for example, the Mexican acacia and the ants that inhabit it or *Opuntia acanthocarpa* (a cactus) and ants.

Coironal

a Spanish term referring to a particular type of grassland plant formation dominated by cespitose plants and typical of Andean highlands.

Collection

the action of gathering together, assembling, or grouping similar things into one place, usually with a particular focus. A plant germplasm collection therefore brings together the germplasm, whether as seeds, propagules, or other genetic material, of particular plants. The focus may be conservational, agricultural, research and educational, environmental, historic, aesthetic, or economical. (See also Active collection; Base collection; Core collection; DNA library; Germplasm bank; Working collection.)

“Comisión Nacional de Bioseguridad”

National Biosafety Commission, which is a central and autonomous advisory organ of Spanish managers on all issues related to GMOs.

Commercialization of GMOs, GMO marketing, or ‘placing on the market’ of GMOs

(a) The act of making available to third parties, of free or onerous character, those products that are totally or partially composed of genetically modified organisms. (b) Any act that implies a delivery of genetically modified organisms, or of products containing them, to third parties.

Community type

(a) A plant or animal association. (b) A given characteristic plant or animal community that is distinguishable by the habitual presence of a dominant species or group of species. It usually finds expression in the existence of a plant community with a given floral composition.

Complete flower

a flower that has all four essential organs (sepals, petals, stamens, and pistils). (See also Incomplete flower.)

Conifers

ancient plants of the Gymnosperm order and whose principal characteristics are that they do not present true flowers but wooden structures, and their leaves are usually needle-like or aciculate.

Consanguinity

the pairing of organisms that are closely related; in plants, this is usually achieved through self-pollination.

Conservation

the conservation of plant genetic resources refers to the maintenance of populations in their natural habitat (in situ conservation) or to samples of these populations in germplasm banks (ex situ conservation). Conservation presumes that the materials are useful or potentially useful and seeks to maintain and manage them for both current and future benefits.

Continuous variation

see Quantitative trait.

Core collection

a collection that groups, into a minimum number of accessions, the greatest variability existing in a base collection. (See also Active collection; Working collection.)

Corm

- (a) The swollen base of a stem shoot, wrapped in dry leaves that look like scales.
- (b) A solid stem structure, with nodes and well-defined internodes.

Corolla

petals, considered collectively.

Correlation

the mutual relationship between two things in such a way that an increase or reduction in one is usually associated with an increase or reduction in the other. Linear correlation is determined by the coefficient of correlation, the value of which may vary from -1 to +1.

Cotyledons

one or a pair of primary leaves of the embryo within the seed and, commonly, the first to emerge in germination.

Cretaceous

a geological period that is famous for a mass extinction of species, known as the 'K-T extinction event', after which modern-day species of both plants and animals evolved.

Cross

- (a) An organism produced by mating parents of different genotypes. (b) To hybridize.

Cross-fertilization

the fusion of an ovule with a sperm cell from two individuals that have different genotypes. (See also Allogamy.)

Cross-pollination

the transfer of pollen from the anther of one plant to the stigma of a flower of another genotypically distinct plant. (See also Self-pollination.)

Crossing-over

the exchange of segments between the chromatids of two homologous chromosomes during meiosis.

Crown

in horticulture, that part of a plant's stem that is located in the soil or below its surface, from which new shoots originate.

Cryopreservation

the conservation of materials at very low temperatures (-196°C), usually in containers with liquid nitrogen.

Cultivar

see Variety.

Cultivated species or domesticated species

a species whose evolution has been influenced by humans seeking to meet their own needs.

Curator-in-charge

that personality, natural or legal, who conserves and administers plant genetic resources.

Cytogenetic map

the configuration of coloured bands of chromosomes observed under the optic microscope after staining.

Cytology

the science that deals with the structure, function, and life cycle of cells.

Cytoplasm (adj. cytoplasmic)

the protoplasm of a cell, except the nucleus.

Cytoplasmic inheritance

heredity that depends on hereditary units of the cytoplasm.

D

Darwinism

the theory of evolution by means of natural selection put forward by Charles Darwin in his book *Origin of Species* published in 1859 and by Alfred Russel Wallace. The theory was based on their observations of the genetic variability that exists within any given species.

Dehiscence

the rupture or opening of a fruiting structure or anther.

Deoxyribonucleic acid

see DNA.

Descriptors

the quantitative or qualitative characteristics, whether morphological, agronomic, or ecogeographic, that permit the identification of a plant at different taxonomic levels.

Desert

originally, a geographical expression that encompasses climatic, botanical, and edaphic concepts. The vegetation growing in such areas is sparse and highly adapted, including cacti, succulents, and spiny shrubs.

Detasselling

the elimination of immature tassels or ears. This practice is followed in the seed production of hybrid maize.

Determinate

(*adj.*) said of an inflorescence in which the terminal flowers open first, thus impeding the extension of the floral axis. An example is the corymb. (See also Indeterminate.)

Dichogamy

in plants, the maturing of male and female organs at different times, thereby ensuring cross-fertilization. (See also Protandry; Protogyny.)

Dicotyledons

(**a**) Those plants or plant species that has two cotyledons or the first pair of leaves forming in the embryo within the seed. (**b**) Any plant whose outstanding characteristic is the presence of two embryonic leaves at germination. (See also Monocotyledons.)

Dihybrid

the result of a cross between parents that differ in two specified genes.

Dioecious

(*adj.*) said of a plant species that has male and female flowers on different individuals. (See also Monoecious.)

Diploid

(**a**) An organism that has two sets (genomes) of chromosomes, that is, a chromosome number of $2n$, as in a zygote. The somatic tissue is normally diploid, in contrast to the gametes, which are haploid. (**b**) (*adj.*) Having two sets of chromosomes. (See also Ploidy level.)

Discontinuous variation

see Qualitative trait.

Disease

the alteration or deviation from the normal physiological state in one or more parts of the plant for generally known causes, and which manifests according to characteristic symptoms and signs, and whose development is more or less foreseeable. (See also Pathogen.)

Dissemination of GMOs

the release to the environment of genetically modified organisms.

DNA or deoxyribonucleic acid

nucleic acid formed by nucleotides in which the sugar is deoxyribose and the nitrogenous bases are adenine, thymine, cytosine, and guanine. Except in retroviruses, which have RNA, DNA codifies the information for cell reproduction and operation and for the replication of the DNA molecule itself. It represents the security copy or deposit of primary genetic information that, in eukaryotic cells, is confined to the nucleus.

DNA bank

see DNA library.

DNA cloning or gene cloning

a technique in genetic engineering that consists of isolating and multiplying a given gene or fragment of recombinant DNA by incorporating it into a host cell (usually a bacterium or yeast) and then isolating copies of DNA thus obtained. (See also Genetic engineering; Molecular cloning.)

DNA fingerprint

(a) The pattern of DNA fragments obtained in restriction analysis of certain highly variable repeated DNA sequences within the genome. Their number and arrangement are virtually unique to each individual and can be used to identify that individual.

(b) The graphic representation of that pattern.

DNA library, DNA bank, gene bank, or genomic library

(a) A bank whose holdings comprise genes or fragments of genes. (b) A collection of recombinant DNA molecules that carry insertions that represent an organism's entire genome. (c) A collection of DNA fragments amplified in cloning vectors. The cloned fragments may come from genomic (chromosomal) DNA or from complementary DNA (cDNA).

DNA sequence

the order of sequence of the nitrogenous bases of the nucleotides that constitute DNA and which codes for all genetic information. When it is a codifier (exon), it defines the order of the amino acids that form the corresponding protein.

Documentation

with reference to plant genetic resources, the procedure by which information (data) on germplasm is identified, acquired, classified, stored, handled, and disseminated.

Domesticated species

see Cultivated species.

Dominant

(adj.) (a) Said of a trait that manifests in the phenotype of a hybrid to the exclusion of the counterpart (recessive) trait. (b) Said of a plant that, by extension of its foliage or root system, modifies and controls the local environment. (c) Constituting the hegemony and biological maximum of one or more species in a community type or of a biological form in a community or plant formation. Dominance is manifested in the biological form's relative contribution to the community's biomass, or as a combination of characters that enables that form to manifest greater participation in a community's physiognomy.

Dominant gene

(a) A gene that needs only one dose to be expressed, thereby masking the presence of its recessive allele. Most dominant alleles represent the evolved and completely functional state of the gene. (b) A gene that manifests itself exclusively in a hybrid, that is, to the exclusion of its counterpart (recessive) allele. (See also Recessive gene.)

Donor parent

see Recurrent parent.

Dormancy

(a) The state of metabolic rest during which the seed is incapable of germinating because of its structural characteristics (embryo or seed coats) or the effect of external conditions (e.g., light, temperature, aeration, and moisture). **(b)** The quality of being latent. **(c)** The state in which a seed, bud, or reproductive structure of a plant is found at rest, inactive, quiescent, or **dormant** but which can initiate activity when the necessary conditions for activation occur.

Duplicate

a germplasm sample that was mistakenly introduced into a collection as a different accession but which is genetically identical to others already in the collection.

Duplicate genes

two or more pairs of genes that produce identical effects, whether together or separately.

E**Ear**

see Spike.

Ecogeographic study

the collection and synthesis of information that is ecological, geographical, and taxonomic in nature, the results of which can be used to establish priorities and strategies for germplasm collection and conservation.

Ecological region, biome, or ecozone

a large geographical region with distinctive plant and animal groups. These groups form a whole that has a characteristic composition resulting from the groups' adaptation to the region's climate and geography. Examples include tropical rainforest, grassland, desert, and tundra.

Ecological system

a system comprising living things and the physical environment where they live. The system is characterized by interdependent relationships based on a recursive interaction that extends for over 5000 million years on our planet.

Ecology

the science that studies living things at their different levels of organization and their interrelationships among themselves and with the environment.

Ecosystem

a dynamic complex of communities of plants, animals, and micro-organisms and their non-living environment; which complex acts as a functional unit.

Ecosystemic harvest

with reference to natural forest products, the harvest that enormously surpasses the ecosystem's natural productivity. In this case, not only is the annual productivity harvested, but also the biomass and soil developed over centuries or millennia. Ecosystemic harvest implies the reduction of the natural resource base and ecosystem productivity. (See also Harvest.)

Ecozone

see Ecological region.

Egg

in plants, the female gamete. (See also Sperm cell.)

Emasculation

the elimination of anthers from a flower, either closed or open, before pollen is released.

Embryo

the rudimentary plant within a seed. The embryo originates from the zygote.

Embryo sac

see Megasporangium.

Endangered or at risk

a category of conservation status, describing taxa that are in danger of extinction and whose survival is unlikely if the causal factors of danger continue operating. It refers to those species (i) of which only a few specimens exist in nature and whose existence is seriously threatened if the causal factors of danger are not removed; (ii) whose populations have been reduced to a critical level; (iii) whose habitat has been so drastically reduced as to be considered in immediate danger of disappearance, thereby leading to their extinction; or (iv) that are possibly already extinct but have been seen in the wild within the last 50 years. (See also Categories of species conservation.)

Endemism

the condition of being **endemic**, **autochthonous**, or **indigenous**. Said of a plant or associated animal that originates in a given country or region and is restricted to that region, that is, aboriginal or native to a given geographical area.

Endosperm or albumen

a triploid tissue that comes from the triple fusion of a spermatid nucleus with the two polar nuclei in the megagametophyte. In seeds of certain species, the endosperm persists as storage tissue for food reserves, which are used during the development of both the embryo and seedling during germination.

Entry

see Accession.

Environment

the sum total of external influences acting on the life, development, and survival of an organism or group of organisms.

Enzyme

a biological catalyst, normally a protein, that mediates and promotes a chemical process without itself being altered or destroyed. Enzymes are extremely efficient catalysts and specifically linked to particular reactions.

Epiphytotic

the unexpected development and usually general distribution of a destructive disease of plants.

Ethnobotany

the study of folklore and history of use, with particular reference to plants.

Evaluation

the measurement, observation, and analysis of a germplasm collection with a view to detecting its potential use. It generally uses descriptors of quantitative traits that are affected by the environment.

Evolution

the history of changes that are at first molecular, then cellular, and finally organic as a result of mutations in DNA; their reproduction; and selection processes, and which are heritable. (See also Co-evolution; Darwinism.)

Ex situ conservation

ex situ literally means out of the original place; hence, the conservation of plant genetic resources outside the areas where they had developed naturally (i.e., outside their natural habitats).

Exons

DNA sequences, specific to genes, and which codify for amino-acid sequences in proteins.

Explant

a segment of tissue or an organ obtained from a plant (e.g., leaf, root, anther, shoot, bud, embryo, and meristem) and used to initiate an in vitro culture.

Extinct in the wild

a category of conservation status, where a species is considered extinct in its natural distribution when it has not been located or sighted in the wild state for the last 50 years (a criterion used by CITES). (See also Categories of species conservation.)

F**Farmers' rights**

those rights attributed to farmers for their contribution (past, current, or future) to the conservation, improvement, and availability of plant genetic resources.

Fats

see Lipids.

Fertilization

the fusion of an ovule and sperm cell (male gamete), forming a zygote.

Filament

in flowers, the column of the stamen that sustains the anther.

Flora

(a) A group of plants with characteristics in common. **(b)** A set of plant species that is found in a given place. It is usually described in terms of a systematic or alphabetical list of all the plant taxa recorded in that place.

Floret

a small flower of an inflorescence, as in the case of a grass panicle or compound spike.

Food chain

a line that can be established in an ecosystem among organisms that feed, one from another. An example of a food chain is plant → butterfly → house wren → barn owl. The food chains are interconnected through common links, creating a **food or trophic network**.

Food security

the capacity and facility of access by all people, over time, to a sufficient quantity of food that permits them to live active and healthy lives.

Forest

a plant community dominated by tall trees or woody plants with few or no branches at the base.

Frost heave

alternating freezing and thawing that causes the soil and the plants it carries to lift. The plants become separated from the soil or their roots are destroyed.

G

Gametes or sexual cells

cells that, when fused, form the zygote. In plants, the gametes are the male sperm cell and the female egg.

Gene

(a) The physical and functional unit of hereditary material that determines a trait or characteristic of an individual and is transmitted from generation to generation. Its material base is constituted by a part of a chromosome known as locus and which codifies information through DNA sequences. By interacting with other genes, cytoplasm, and the environment, it affects or controls the development of a trait. **(b)** The receptacle of genetic material that is particular to a given species.

Gene bank

see DNA library; Germplasm bank.

Gene cloning

see DNA cloning.

Gene expression

the protein product resulting from the set of mechanisms that decode the information contained within a gene, processing it through transcription and translation.

Gene flow

the exchange of genetic material between populations through the dispersion of gametes and zygotes.

Gene interaction

the modification of gene action through non-allelic genes.

Genetic code

a code written according to the distribution of nucleotides in the polynucleotide chain of a chromosome. It governs the expression of genetic information in proteins, that is, the succession of amino acids in the polypeptide chain. Information on all genetically determined characteristics of living things is stored in DNA and deciphered through four nitrogen bases. Each succession, adjacent to three bases (or codon), governs the insertion of a particular amino acid, of which there are four: adenine, guanine, thymine, cystosine. In RNA, thymine is replaced by uracil. This information is transmitted from one generation to the next through the production of exact replicates of the code.

Genetic drift

a random fluctuation of genetic frequencies of a population from generation to generation, caused by factors such as natural selection. It is more evident in small isolated populations, and may lead to the fixation of an allele and to the extinction of the other.

Genetic engineering, genetic manipulation, or recombinant DNA technology

(a) The process of forming new combinations of hereditary material by inserting nucleic acid molecules, obtained from outside the cell, into any virus, bacterial plasmid, or other vector system outside the cell. Thus, the host organism incorporates the new hereditary material in a way that does not appear natural, but where such molecules are able to reproduce continuously. **(b)** That set of techniques used to introduce a foreign heterologous gene into an organism to modify its genetic material and products of expression. (See also DNA cloning; Molecular cloning.)

Genetic erosion

the loss of genetic diversity, that is, of genetic materials, including individual genes or combinations of genes (genetic complexes), genotypes, and species.

Genetic identity

the characteristic that should be maintained during conservation. This refers to the maintenance, as a set, of all the alleles of all the accession's genes.

Genetic instability

susceptibility of stored seeds to cumulative genetic changes (with age), resulting in the alteration of the initial genetic structure of the conserved sample.

Genetic integration

the insertion of a DNA sequence into another through recombination.

Genetic manipulation

see Genetic engineering.

Genetic map

a descriptive diagram of the genes in each chromosome.

Genetic material

all material, whether of plant, animal, microbial, or other origin, that contains functional units of heredity.

Genetic recombination

(a) A combination of alleles from different parents that produce a recombinant individual. Such an organism or progeny may result from a crossing event or from an independent reorganization of different chromosomes during meiosis. (b) In genetics, the term refers to new combinations of sequences that result from the physical interaction of two DNA molecules. *In vitro*, the term refers to genetic re-arrangement among DNA fragments from different or noncontiguous origins. *In vivo*, this occurs between homologous copies of a single gene (chromosomal manipulation) or as a result of integrating a genetic element (transposon, prophage, or transgene) into the genome.

Genetic resources

(a) That set of population samples, whether from plants, animals, or micro organisms, that is acquired to provide useful genetic traits with present or potential value. (b) The good or medium potential found in genes. (c) The genetic variability stored in chromosomes and other structures containing DNA. (See also Plant genetic resources.)

Genetic stability

the maintenance of a certain degree of genetic balance in each individual of a population.

Genetic uniformity

the condition in which individuals of a population present identical or very similar genetic structures, so that one may deduce that they will behave similarly and will have the same susceptibility in terms of biotic and abiotic stresses. This condition potentially endangers the persistence of such a population, a situation that is known as genetic vulnerability. Both situations are more likely to occur when the population has been genetically improved, and whose tendency is to give rise to genetically uniform populations, whether homozygous or heterozygous.

Genetic variability

the degree of genetic variation existing in a population or species, as a consequence of the evolutionary processes to which it has been subjected. **It is** that set of differences present among individuals of a single species. Genetic variability is the basis on which plant breeders develop new varieties.

Genetic variation

the heritable variation, derived from changes in genes, usually because of environmental factors.

Genetic vulnerability

the condition where the risk of exposure is high for plants that are susceptible to certain pathogens, pests, and environmental stress as a result of genetic uniformity, induced by breeding. (See also Genetic uniformity.)

Genetically modified organism or GMO

any organism whose genetic material has been modified in a way that would not happen naturally in mating (or multiplication) or in natural recombination. GMOs are classified as high or low risk, according to the nature of the receiving or parental organism, and the characteristics of both vector and insert used in the operation.

Genetics

the science that deals with reproduction, inheritance, variation, and the set of phenomena and problems related to descendency, that is, the science that deals with heredity.

Genome

(a) The set of all genes of an organism, of all the genetic patrimony stored in the set of its DNA or chromosomes. **(b)** Also a set of chromosomes, as appears within a gamete, corresponding to the haploid number of chromosomes of a given species.

Genomic library

see DNA library.

Genotype

(a) The genetic composition of an organism, that is, the total sum of its genes, both dominant and recessive. **(b)** A group of organisms with the same genetic composition. **(c)** The genetic constitution of one or more genes of an organism with respect to a particular hereditary trait or set of traits. **(d)** In plants, that set of hereditary factors that regulate the organism's way of reacting to external stimuli.

Genotypic ratio

the proportion of different genotypes of a given progeny. (See also Phenotypic ratio.)

Germ cell

one of two cells found in the pollen grain and which divides by mitosis into sperm cells. This division may occur before or after pollination.

Germination

in plants, the resumption of the embryo's growth under favourable conditions after the seed has matured and dispersed, and the emergence of the young root and shoot from the seed. Germination is taken as completed when photosynthesis begins and the plant no longer relies on the food stored in the seed.

Germplasm

(a) The base material of heredity, that is, the structure that carries the total sum of hereditary characteristics of a species. The word 'germplasm' supposes that the structure is able to give rise to a new generation, transmitting its genetic characteristics. **(b)** The total genetic variability, represented by germ cells, available for a given population of organisms. **(c)** The potential hereditary materials of a species, considered collectively.

Germplasm bank or gene bank

an entity constituted to conserve genetic resources. For plants, it is the most practical method of safeguarding genetic material, storing samples of landraces, breeding products, varieties not in use, and wild species.

Glumes

bracts or leaves found on the outside of each spikelet in a grass inflorescence or spike.

GMO

see Genetically modified organism.

GMO marketing

see Commercialization of GMOs.

Graft

a procedure by which two parts of living plant tissue are brought together so that they continue living and later behave as one plant.

Grassland

that type of vegetation or plant formation dominated by grasses and herbaceous plants. Various forms are found such as the Sahel; savannah; steppe; and veldt.

Gymnosperms

plants of ancient origins that present the characteristic of not possessing true flowers. In their place are reproductive structures known as cones.

H

Habitat

(a) A particular place in the environment occupied by organisms or communities of organisms and with which they interact. The habitat is described in relation to those interactions. (b) A place where a plant or animal grows.

Haploid

(a) The cell or individual that has one set of chromosomes. (b) The reduced number (n), as of a gamete. (c) (*adj.*) Having one set of chromosomes. (*See also Ploidy level.*)

Harvest

(a) The collection of fruits to obtain the seeds. (b) Ecologically, it is understood as the removal, at a given moment, by humans of part of the biomass from the ecosystem. (*See also Ecosystemic harvest.*)

Hereditary disease

a disease that has, as its cause, the alteration of genetic material and which is transmitted from generation to generation.

Heredity (*adj.* hereditary) or inheritance

the transmission of genetically based characteristics from parents to progeny or from generation to generation.

Heritability

(a) The capacity of being inherited. (b) That part of the variation observed in a progeny that is due to heredity.

Heterosis or hybrid vigour

the increase in vigour, growth, size, yield, or functional activity of a hybrid progeny in terms of its parents, resulting from the crossing of genetically different organisms.

Heterotrophs

see Primary consumers; Secondary consumers.

Heterozygote

(a) The genetic condition whereby the individual possesses two different alleles in a locus.
(b) Also an organism with one or more heterozygous gene pairs. (c) An organism that does not reproduce exactly the same as itself. (See also Hybrid.)

Heterozygous

(adj.) said of an organism that has different alleles in the locus corresponding to homologous chromosomes. An organism may be heterozygous for one or more genes. (See also Homozygous.)

Hexaploid

an organism that has six sets of chromosomes, that is, with a chromosome number of 6n. (See also Ploidy level.)

Homologue exchange

the exchange of segments between chromatids of two homologous chromosomes during meiosis.

Homologous chromosomes or homologues

chromosomes that pair up during the first division in meiosis. Each member of the pair comes from a different parent and has a sequence corresponding to the locus of genes.

Homozygous

(adj.) said of an organism or **homozygote** that has similar genes in the corresponding loci of homologous chromosomes. An organism may be homozygous for one, several, or all genes. (See also Heterozygous.)

Hormone

a chemical substance of specialized action that acts as messengers to those cells that respond to its stimulus, thereby controlling tissues and organs in any part of the organism. The difference between animal and plant hormones is that animal hormones are created in particular organs and regulate almost all organic functions.

Host

(a) An animal or plant that harbours or nourishes another organism (e.g., parasite).
(b) In genetic engineering, that organism, whether microbial, animal, or plant, whose metabolism is used to reproduce a virus, plasmid, or other form of DNA foreign to that organism and which incorporates elements of recombinant DNA.

Hybrid

(a) The first generation of offspring of a cross between two individuals that differ in one or more genes. (b) The progeny of a cross between species of the same genus or distinct genera. (See also Heterozygote.)

Hybrid vigour

see Heterosis.

Hybridization

(a) The crossing of genetically different individuals, thereby generating new genetic combinations and variability. (b) A method for creating new varieties, using crosses to obtain genetic recombinations. (c) The generation of a molecule, cell, or organism combined with genetic material from different organisms. Traditionally, hybrids were produced by crossing distinct varieties of animals or plants by aligning or pairing the bases of two simple-stranded DNA molecules that are homologous or complementary. The technology of cellular fusion and transgenic manipulation are new hybridization modalities introduced by genetic engineering.

Hybridize

to produce hybrids by crossing individuals with different genotypes.

I

Immediate principles

see Biomolecules.

Immune

(adj.) (a) Free of attack from a given pathogen. (b) Not subject to a given disease.

Imperfect flower

a flower that does not have stamens or pistils. (See also Perfect flower.)

In situ conservation

in situ literally means 'in the original place'. The conservation of plant genetic resources in the areas where they had developed naturally and, in the case of cultivated species or varieties, in the surroundings of the area where they had acquired their distinctive properties.

In vitro

(adj.) *literally*, in the glass. Said of anything studied and manipulated in laboratory test tubes, that is, outside the live organism.

Incompatibility

in plant reproduction, (a) the absence of fertilization and later seed formation. (b) The condition in which viable gametes cannot fuse because, for example, the stigma reduces or restricts the growth of the pollen tube; the formation of reproductive organs is not synchronized; or structural and/or functional barriers exist such as dichogamy, protandry, and protogyny. (c) The impossibility of achieving fertilization and seed formation through self-pollination, usually because of sluggish growth of the pollen tube in the style tissue.

Incomplete dominance

the production of an effect by two different alleles. This effect is intermediate between those produced by the same alleles under homozygous conditions. (See also Partial dominance.)

Incomplete flower

a flower that lacks one or more of the four essential organs (sepals, petals, stamens, and pistils). (See also Complete flower.)

Independent association

a random association of two or more pairs of segregating genes in gametes.

Indeterminate

(*adj.*) said of an inflorescence in which the terminal flower is the last to open. The flowers are formed in axillary buds and the floral axis may elongate indefinitely by means of a terminal bud. An example is the raceme. (See also Determinate.)

Indeterminate threat

a category of conservation status, describing taxa that are known to be either endangered, vulnerable, or rare, but not which one. (See also Categories of species conservation.)

Indigenous

see Endemism.

Infection

the invasion of a living being by a pathogen, thereby triggering disease.

Inflorescence

a group of flowers growing on a floral axis, and having a characteristic arrangement and form of development. Inflorescence arrangements may be determinate or indeterminate. (See also Panicle; Spike.)

Inherit

to receive from predecessors. In organisms, the chromosomes and genes are transmitted or inherited from one generation to the next.

Inheritance

see Heredity.

Inoculate

(**a**) To place an inoculum where it will produce an infectious disease. (**b**) To introduce bacterial nitrogen fixers into the soil, usually by treating seeds before planting.

Inoculum

the spores, bacteria, or mycelium fragments of pathogens that can infect plants or soil.

Insufficiently known

(*adj.*) (**a**) A category of conservation status, describing taxa that are thought to belong to a given category related to risk of extinction but for which insufficient information is available. (**b**) Also said of species or other taxa thought to belong to a given category, but whose status is to be defined through future research. (See also Categories of species conservation.)

Introns

DNA sequences that do not code for genes and whose function is unknown.

Inverse transcription

the synthesis of complementary DNA from genomic RNA of retroviruses done by the enzyme known as inverse transcriptase.

Isoenzymes

multiple molecular forms of an enzyme that occur within an organism. They have the same catalytic function (catalyzing the same substrate) but possess different kinetic properties (e.g., reaction speed). (See also Alloenzymes.)

K

Kilobase or kb

the unit used to measure the length of a DNA fragment, itself made up of a series of bases. 1 kb = 1000 bases.

L

Latency (*adj.* **latent**)

see Dormancy.

Leaf (*pl.* **leaves**)

in plants, an expanded outgrowth of a stem, usually green, and the main photosynthetic organ of most plants.

Legislation *sui generis*

a particular form of protection of intellectual property, especially designed to cover certain criteria and needs.

Lemma

in a grass spikelet, the lower bract of two that protect the floret. (See also Palea.)

Life form

(a) The characteristic morphology of a mature organism. **(b)** According to the Raunkiaer system, the mechanisms by which plants survive the unfavourable season. Raunkiaer originally listed five types of life forms: phanerophytes, chamaephytes, hemicryptophytes, cryptophytes, and therophytes. His classification has since been broadened to include other mechanisms for plant survival under unfavourable conditions such as those used by, for example, epiphytes, succulents, halophytes, climbers, and hydrophytes.

Line

a group of individuals that descend from a common ancestor. Members of such a group are usually more closely related to each other than those of a variety.

Lineage

(a) A group of individuals whose descent can be traced back to a single ancestor. **(b)** In evolution, a sequence of species, each of which is considered to have evolved from its predecessor.

Linkage

the relationship that exists between two or more genes that tend to be inherited together because they are located on the same chromosome. This determines that combinations of these genes, like those of the parents in the gametes, are more frequent than their recombinations.

Linkage group

a group of genes distributed linearly in a chromosome.

Linkage map

a diagram of a chromosome, indicating the position of genes.

Lipids or fats

a group of chemically very diverse organic biomolecules with the common characteristics of insolubility in water, solubility in polar organic solvents, and with little density.

Liposomes

artificially constructed spherical vesicles made up of two or more layers of lipids. Liposomes are used as gene vectors.

Llaretal

a Spanish term referring to a particular type of plant community in which pulvinate plants predominate. It is characteristic of the high plains and highlands of South America and is often made up of Umbelliferae species, and the *Azorella* and *Laretia* genera, called commonly *llaretas*.

Locus (pl. loci)

(a) A position on a chromosome where the gene controlling a given trait is located.
(b) In genetics, the point on a chromosome occupied by a gene.

Lodicule

one of two structures, similar to scales, at the base of an ovary of a grass flower.

Longevity

the length of life. In seeds, it refers to the time that these remain alive. Longevity depends on the species and on the seeds' storage conditions.

Loricifera

a new small phylum of marine sediment-dwelling animals. So far, 22 species from 8 genera have been described. About another 100 species have been collected but are not yet described. The phylum was discovered in 1983 by Reinhardt Kristensen, in Roscoff, France.

M

Male sterility

in flowering plants, a condition whereby pollen is not produced or is sterile, or that part of the male organ that produces it does not function.

Marker gene

that gene whose function and location are known and which expresses certain characteristics or very notable phenotypic differences that permit the analysis of its heredity, establish its presence in the genome, and detect recombination events.

Mass selection

that system of plant improvement in which the seed of individual plants is selected on the basis of phenotype and then mixed and used to produce the next generation.

Megagametophyte

in plants, the female gametophyte. Typically, a female gamete of seven cells with eight nuclei. It originates from the megaspore.

Megasporangium or embryo sac

the structure in which the megaspores are produced and the megagametophyte later develops. It eventually forms the nucellus.

Megaspore

(a) One of four haploid spores that originate from meiotic divisions of the stem cell.
(b) In plants, also the diploid megaspore found in the ovule and which undergoes three successive meiotic divisions to give rise to the megagametophyte. It is formed in the megasporangium from a stem cell when it undergoes meiosis.

Megaspore stem cell

a diploid cell of the ovary, which gives rise, through meiosis, to four haploid megaspores.

Meiosis

the two successive nuclear divisions of a cell. In the first (or reduction) nuclear division, the diploid chromosome number is reduced to a haploid number. The second nuclear division is mitotic. (See also Mitosis.)

Meristem

(a) A region of rapid cellular division (mitosis). (b) Undifferentiated tissue from which cells tend to form differentiated and specialized tissues. Meristems found in growing areas such as buds and apices.

Messenger RNA

see mRNA.

Microbe

see Micro-organism.

Micro-injection

a technique, carried out under the microscope, that introduces a gene in solution into a cell, using a micropipette.

Micro-organism or microbe

a microscopic organism, usually a bacterium, alga, fungus, or protozoan.

Microsatellites, simple sequence repeats, or SSRs

short DNA sequences made up of 1 to 6 nucleotides that repeat themselves consecutively 10 or more times. These simple DNA sequences are highly variable and can be studied, using a fast and relatively simple methodology.

Microspore

in plants, one of four haploid spores that originate from the meiotic division of the microspore stem cell in the anther and gives rise to a pollen grain.

Microspore stem cell or pollen stem cell

a diploid cell of the anther, which gives rise, through meiosis, to four haploid microspores.

Mitosis

the nuclear division of a cell, whereby chromosomes divide longitudinally, forming two daughter nuclei, each of which has a chromosome complex like that of the original nucleus. (See also Meiosis.)

Molecular biology

(a) That part of biology which deals with biological phenomena at the molecular level. (b) In a restricted sense, it includes the interpretation of these phenomena on the basis of participation of proteins and nucleic acids.

Molecular cloning

(a) A technique of genetic engineering that consists of inserting a segment of foreign DNA of a given length into a vector that replicates itself in a specific host. (b) The formation of heritable material that can propagate or grow through culturing from a line of genetically identical organisms. (See also DNA cloning; Genetic engineering.)

Molecular markers

gene markers that are used to directly evaluate the genome (DNA), or part thereof without their being affected by the environment, thus conferring greater accuracy.

Monocotyledons

modern plants, whose principal characteristic is to develop only one embryonic leaf (cotyledon) on germinating. (See also Dicotyledons.)

Monoecious

(adj.) said of a plant species that has both staminate and pistillate flowers on the same individual. (See also Dioecious.)

Monosomic

(adj.) (a) Refers to a chromosome that lacks its homologous partner. (b) A haploid chromosome in an individual that otherwise would be a normal diploid.

Morphometry

the study of anatomical measures.

Mosaic

(a) In plant pathology, a viral disease characterized by the presence of irregular patches of different colours or colour intensities. (b) See Chimaera.

mRNA or messenger RNA

a molecule of RNA that represents a negative copy of amino acid sequences in a gene. The non-coding sequences (introns) have already been extracted. With few exceptions, mRNA has a sequence close to 200 adenines (polyA tail), united to its 3' extreme, which is not coded by DNA.

Multiple alleles

a series of alleles or alternative forms of a gene. A normal heterozygous diploid would have only two genes of an allelic series. Multiple alleles originate by repeated mutations of a gene, in which each mutant produces different effects.

Multiple genes

two or more pairs of independent genes that produce complementary or cumulative effects on a single trait of the phenotype.

Mutation

(a) A change in the breeding material. It may arise from changes in a pair of DNA bases, particular gene, or chromosomal structure. **(b)** An unexpected variation in the hereditary material of a cell. **(c)** A sudden variation or alteration in an organism, which is then said to be a **mutant**, especially when such alteration is heritable by following generations. It may involve changes in genes (genic mutation) or chromosomes (chromosomal mutation). A genic mutation consists of a change in one allele or another of a gene. A chromosomal change may consist of, for example, a duplication, inversion, or exchange.

N**Naked DNA**

(a) DNA that is deprived of its proteinic or lipidic coat. **(b)** In gene transfer, the term refers to DNA made up of a bacterial plasmid that contains the gene to be transferred. It is injected directly in the targeted tissue where it is usually expressed without being integrated in the genome of the host cells.

Native race

a population of usually heterozygous plants that were commonly developed in traditional agricultural systems through direct selection by farmers and which, characteristically, are adapted to local conditions.

Natural cross

in plants, a result of cross-fertilization, usually under natural conditions, where one parent of a plant's genetic constitution is different to the other.

Natural selection

(a) The elimination of random alleles, without intervention from humans. **(b)** The process Darwin called the 'struggle for survival', whereby those organisms least adapted to their environment tend to die and the better adapted to survive. According to Darwinism, natural selection acts on a varied population, causing its evolution. Natural selection appears as the inevitable result of three basic facts of life: overpopulation, variability, and heredity.

Naturalized

(adj.) said of a plant that is not native to a country or region but lives there, surviving as if it were indigenous.

Neotropics

a biogeographical region, which spans several habitat types, but has strong biogeographic affinities, particularly at taxonomic levels higher than the species level. It extends from southern Mexico, through Central America and the West Indies, and includes the South American continent. (*See also Afrotropic.*)

Nucellus

the megasporangium, after it eventually forms the inner layer of the ovule wall.

Nucleic acids

biomolecules formed by nucleotide macropolymers or polynucleotides. Present in all cells, they constitute the basic material of heredity that is transmitted from one generation to another. Two types exist: deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).

Nucleoside

a combination of a pentose sugar with a purine or pyrimidine nitrogenous base.

Nucleotide

a monomer of nucleic acids, made up of a combination of a nitrogenous base (purine or pyrimidine), sugar (ribose or deoxyribose), and a phosphate group. It is the product of hydrolysis of nucleic acids through the action of nucleases.

Nullisomic

a plant that, if it were not for the lack of a pair of particular chromosomes, would be a normal diploid.

O**Obsolete variety**

those plant varieties that are no longer cultivated commercially but may be kept in collections for use in improvement programmes.

Offshoot or tiller

(a) A characteristic type of lateral shoot or branch that develops from the base of the principal stem in certain plants. **(b)** The term 'tiller' is applied to several lateral shoots that emerge from the crowns of monocotyledons such as grasses.

Operator

a special segment of DNA, adjacent to the promoter, that is part of the controlling region for operon transcription. The operator interacts with the repressor protein, thus regulating the synchronized transcription of the corresponding operon.

Operator gene

the gene that stimulates the structural gene into functioning. Its activities may be modified by the regulatory gene.

Operon

a set of genes, comprising an operator gene and the structural genes that it controls.

Organism

a biological entity able to reproduce itself or transfer genetic material. Microbiological entities are included within this concept, whether or not they are cellular. Almost all organisms are formed of cells, which may then be grouped into organs, and these into systems, each of which carries out particular functions.

Orthodox seed

seed that can be dried to low levels of moisture content and stored at low temperatures over long periods without losing viability. (See also Recalcitrant seed.)

Out of danger

a category of conservation status, describing a species or other taxon that had been included in a higher category on the continuum to extinction, but is now considered to be in a relatively safe state of conservation due to the adoption of effective conservation measures or elimination of previously existing threats. (See also Categories of species conservation.)

Ovary

in flowers, the swollen base of the pistil, in which seeds are formed.

Ovule

in plants, **(a)** the female gamete or germ cell. **(b)** The structure that contains the female gamete or megagametophyte and becomes seed after fertilization.

P

Palea

in a grass spikelet, the upper of two bracts that protect the floret. (See also Lemma.)

Panicle

an open and branched inflorescence, with flowers possessing stalks or pedicels.

Parasite (*adj.* **parasitic**)

a living being that, for all or part of its life, derives its food from another living being (the host). The host is usually harmed to some extent by the association.

Parthenocarpy

in plants, the production of fruits without fertilization and normally without seeds.

Parthenogenesis

(a) The development of an individual from a gamete without fertilization. **(b)** Unisexual reproduction, where females give rise to offspring without being fertilized by males, for example, rotifers and certain crop pests such as aphids.

Partial dominance

(a) The lack of complete dominance. **(b)** The production of an intermediate hybrid among reproducing types. (See also Incomplete dominance.)

Patent

the exclusive right granted to the ownership of an invention as a social counterpart to the innovation.

Pathogen (*adj.* **pathogenic**)

(a) The producer or causal agent of a disease. **(b)** An organism able to incite disease.

Pathogenicity

the capacity of an organism to cause or incite disease.

PCR or **polymerase chain reaction**

a technique for analysing the genome by an unlimited amplification of minuscule but particular parts of DNA. It is a revolutionary method of exponential amplification of DNA that uses the intervention of a heat-stable enzyme, the *Taq* polymerase.

Pentaploid

an organism that has five sets of chromosomes, that is, with a chromosome number of 5n. (See also Ploidy level.)

Peptide

a polymer or amino acid chain.

Perennial

a plant that lives for 3 years or more. They may be woody such as shrubs and trees, or herbaceous. Herbaceous perennials may be evergreen; deciduous (i.e., the aerial organs are annual but the underground organs such as rhizomes and bulbs are persistent); or monocarpic, that is, living for many years until flowering and fruiting, after which they die, for example, *Agave* spp. (See also Annual; Biennial.)

Perfect flower

a flower that has stamens and pistils. (See also Imperfect flower.)

Persistent

(*adj.*) said of a plant organ that remains inserted or does not fall at maturity once it has fulfilled its physiological function.

Pests

in agriculture, organisms such as insects, nematodes, and other plants that attack crops and livestock. (See also Disease; Pathogen; Weeds.)

Phenotype

(a) The final appearance of an individual that results from the interaction of its genotype with a given environment. **(b)** The observable characteristics of an organism. **(c)** The physical or external appearance of an organism, in contrast to its genetic constitution (genotype). **(d)** A group of organisms of similar external physical constitution. **(e)** The set of all apparent characters expressed by an organism, whether these be hereditary or not.

Phenotypic ratio

the proportion of different phenotypes of a given progeny. (See also Genotypic ratio.)

Physiognomy

that aspect of a plant community or species that is subject to visual appraisal. It depends on the set of special structures and characteristic forms of its biological constituents.

Physiological race

those pathogens of the same species and variety that are similar structurally, but differ in their physiological and pathological characteristics and, especially, in their ability to parasitize different varieties of a given host.

Phytosanitary quality or plant health quality

the set of characteristics that plant germplasm should have with respect to the presence or absence of pathogens transmissible in planting materials and/or micro-organisms that cause deterioration during conservation.

Pistil

in flowers, the female organ where the seed originates. It comprises the ovary, style, and stigma.

Pistillate flower

a flower that bears pistils but has no stamens. (See also Staminate flower.)

'Placing on the market' of GMOs

see Commercialization of GMOs.

Plant community

a more or less complex group of plants that occupy a certain area, regardless of the character, composition, and structure that the plants present.

Plant formation

that group of plant communities, delimited in nature by particular physiognomic characters, depending on the dominant forms of life and the way in which space is occupied. A plant formation represents the expression of given living conditions and has, as its base, a particular type of environment.

Plant genetic resources

these are the total of all the gene combinations produced during plant evolution. They range from wild species with agricultural potential to cloned genes. The term implies that the material has or may have economic or utilitarian value, whether current or future, perhaps the most important being that which contributes to food security. (See also Genetic resources.)

Plant health quality

see Phytosanitary quality.

Plasmagene

the cytoplasmic unit of heredity.

Plasmid

(a) A non-cellular form of life. (b) A circular fragment of double-stranded DNA that contains some genes and is found within certain bacteria. It acts and replicates independently of bacterial DNA and may pass from one bacterium to another. As with proviruses, they do not produce diseases but induce small mutations in cells. They are used as vectors in genetic engineering.

Ploidy level

the complete number of complements or basic sets of chromosomes that a cell or organism has. The living unit may be haploid, diploid, triploid, tetraploid, pentaploid, or hexaploid if it possesses 1, 2, 3, 4, 5, or 6 basic sets of chromosomes, respectively. A polyploid is that which has more than two sets of chromosomes, and an aneuploid does not have an exact set.

Point mutation

a type of mutation that causes the replacement of a single-base nucleotide with another nucleotide. Often includes insertions or deletions of a single base pair.

Polar nuclei

the two central nuclei found within the megasporangium and which join with the second sperm cell in triple fusion. In certain seeds, the product of this triple fusion gives rise to the endosperm.

Pollen

a fine powder produced by anthers and male cones of seed plants, composed of **pollen grains**. Each grain encloses a developing male gamete, itself having originated from a microspore.

Pollen stem cell

see Microspore stem cell.

Pollen tube

a tube that, under favourable circumstances, develops from the pollen grain after being placed on the stigma of a flowering plant. It grows down the style to the ovary and eventually to an ovule. The sperm cell is carried to its destination in the tip of the pollen tube.

Pollination

the transfer of pollen from the anther to the stigma in flowering plants or from the male to the female cone in gymnosperms. (See also Cross-pollination; Self-pollination.)

Polycross

an isolated group of plants or clones distributed so that random cross-pollination can occur.

Polymer

a chemical compound formed by the combination of repeated structural units (monomers) or linear chains of the same molecule.

Polymerase chain reaction

see PCR.

Polyploid

an organism with more than two sets of chromosomes in its cells. (See also Ploidy level.)

Population

a group of individuals of a species living in the wild in a given area. It is the most significant level of organization of a species and is also of evolutionary and conservational significance.

Precaution

a basic criterion that governs, *a priori*, any environmental action. The criterion is incorporated into the Maastricht Treaty on the European Union, by which any substance, organism, or technology must demonstrate its compatibility with the environment and public health before its production and use are authorized.

Prevention

a basic criterion that governs, *a posteriori*, any environmental action. The criterion is incorporated into the Maastricht Treaty on the European Union, by which the original cause of existing environmental damage is avoided to prevent it recurring.

Primary consumers or heterotrophs

these organisms take advantage of the chemical energy stored in the organic matter of primary producers. This level is composed of herbivores.

Primary producers or autotrophs

these take advantage of the energy from light, using photosynthesis. They are able to synthesize organic matter from inorganic matter. This level corresponds to that of green plants. (See also Primary consumers; Secondary consumers.)

Primary production

this represents the increase in biomass of the primary or photosynthetic producer organisms. Gross primary production refers to the biomass synthesized through the photosynthetic activity of primary producers.

Prion

a protein of infectious character that is able to reproduce. It originates from a natural and innocuous protein that is transformed into a harmful form, able to resist proteases, ionization, and ultraviolet radiation. Although it is found mostly in animals, being responsible for diseases such as bovine spongiform encephalopathy, Creutzfeldt-Jakob disease, and kuru, it is also found in certain fungi and plants.

Production

that process which increases biomass per unit of time. It may be measured in $\text{mg cm}^{-3} \text{ day}^{-1}$, $\text{kg ha}^{-1} \text{ year}^{-1}$, or $\text{kcal ha}^{-1} \text{ year}^{-1}$. It expresses the idea of biomass available per unit of time for use by the next trophic level without endangering the ecosystem's stability. $\text{Production} = \text{Biomass}/\text{Time}$.

Productivity

this is the relationship between production and biomass. In algae, for example, which reproduce daily, that is, they double their mass every 24 hours, productivity is 100%. In contrast, the average productivity in land plants does not reach 0.3%. For example, an almond tree forms almonds only once a year. $\text{Productivity} = \text{Production}/\text{Biomass}$. (See also Biomass and ecosystem productivity.)

Prokaryotes

organisms whose cells possess a single chromosome and no membrane to isolate it from the cytoplasm. This means that such an organism lacks a true cellular nucleus. The most representative examples are blue-green algae and bacteria.

Promoter

a region of DNA that is involved in and necessary for the initiation of transcription. It includes the RNA polymerase binding site (the starting point of transcription) and various other sites at which gene regulatory proteins may bind.

Propagule

any structure that serves to vegetatively propagate or multiply a plant, for example, cuttings, tubers, differentiated tissues, and cells.

Prophylaxis or preventive treatment

in phytosanitary procedures, a measure or set of measures taken to prevent the occurrence of disease. This may include the use of **protectants**, which are usually chemical agents, to prevent a given disease or diseases among plants.

Protandry

the condition of hermaphrodite plants where male gametophytes mature and are shed before female gametophytes are mature. (See also Dichogamy; Protogyny.)

Proteins

biomolecules formed by amino-acid macropolymers or macropolypeptides. They function as enzymes, hormones, and contractile structures that endow organisms their characteristic size, metabolic potential, colour, and physical capacities.

Protocol

a document of standardization that establishes the rationale, objectives, design, methodology, and foreseen analysis of results, and the conditions under which such activities are to be carried out and developed.

Protogyny

in hermaphrodite plants, the condition where female gametes mature and are shed before male gametes mature. (See also Dichogamy; Protandry.)

Protoplast

a cell that is isolated and deprived of its cell wall.

Pteridophyta

a taxonomic class of plants of ancient origins. The plants are principally characterized by the absence of true roots (they have rhizomes) and reproduce by spores.

Pulvinate

(*adj.*) said of vegetation that develops in the form of pads or cushions.

Pure line

(**a**) A genetically pure line where all its members are homozygous, having originated from the self-fertilization of a simple homozygous individual. (**b**) Genetically pure individuals (homozygotes) who originated from self-fertilization and whose offspring are equally homozygous and homogeneous.

Q**Qualitative trait or discontinuous variation**

a trait whose observed variation is discontinuous, or which presents several states. It is usually controlled by one or a few genes, with little or no influence from the environment (e.g., yellow flower versus white flower).

Quantitative trait

(**a**) A trait that is determined by a series of independent genes that have cumulative effects. (**b**) Also **continuous variation** where a trait whose observed variation is continuous and is usually controlled by many genes, with strong influence from the environment.

Quarantine

a procedure of legal character that consists of confining or isolating plants or other materials introduced from other countries. They are then subjected to inspection to detect plant health problems that could threaten the agriculture of the country which they are entering.

R

RAPD or **random amplified polymorphic DNA**

polymorphic DNA amplified at random.

Rare

(*adj.*) **(a)** A category of conservation status given to taxa whose world populations are small, but are not currently at risk of extinction or vulnerable, even though they are subject to a certain degree of risk. These taxa are normally located in restricted geographical areas or habitats, or have extremely low density over a more-or-less broad distribution. **(b)** With respect to species, the term refers to intraspecific taxa that apparently have always been scarce and are in their last stages of natural extinction. **(c)** Or the term refers to species with very restricted distribution, few defences, and few powers of adaptation. (See also Categories of species conservation.)

rDNA or **recombinant DNA**

a DNA molecule formed by recombining DNA fragments from different origins. The protein that codes is a recombinant protein.

Recalcitrant seed

seed that cannot be dehydrated nor conserved at low temperatures without suffering damage. It can be stored for only few days or weeks under special treatment. Species that have recalcitrant seeds or do not produce seeds are usually conserved in field germplasm banks. In these areas, collections of live plants are kept, that is, the germplasm is conserved as a permanent live collection. (See also Orthodox seed.)

Recessive gene

(a) That gene which needs a double 'dose' to be expressed. **(b)** A gene that does not manifest itself in the presence of a counterpart or dominant allele. (See also Dominant gene.)

Recombinant DNA

see rDNA.

Recombinant DNA technology

see Genetic engineering.

Recombination

the formation of new gene combinations as a result of cross-fertilization between individuals that differ in their genotype.

Recurrent parent or **donor parent**

in plant improvement, in a back cross, that parent with which the hybrid material is again crossed.

Recurrent selection

that system of genetic improvement designed to increase the frequency of genes favourable for yield or other characteristics through repeated selection cycles.

Reduction division

see Meiosis.

Regeneration or rejuvenation

within the context of germplasm banks, the cultivation of a sample of an accession (e.g., seed, clone, in vitro plant, or other propagule) to produce fresh, viable, and sufficient samples of plants from which sexual or asexual seeds with similar genetic constitution can be harvested, and which permits the preservation, in a better state, of the seed or propagule when stored.

Registered seed

progeny of basic seed or certified seed that is produced and used in such a way that it satisfactorily maintains its identity and genetic purity. It is approved and certified by an official certification agency.

Regressive form

with reference to crops, a species related to the cultivated form, growing in the wild, but not used in agriculture. It usually shows characteristics of both the cultivated species and its wild relatives.

Regulatory gene

an ancient gene whose mutations can influence evolution. It also modifies the action of the operator gene.

Rejuvenation

see Regeneration

Relicts (*adj.* **relict**)

in the sense of **relicts**, those plants that had been dominant in other times, but which are now scarce. By extension, a country's original vegetation that remains or persists.

Replication

(a) That process by which a DNA or RNA molecule originates from another identical one.

(b) Generally, the duplication of nucleic acid.

Replicon

a nucleic acid structure that can replicate. Replicons include chromosomes of eukaryote cells, prokaryotic nuclear DNA, plasmids, and viral nucleic acids.

Representative sample

a sample that contains at least 95% of alleles (genetic variability) of the sampled population.

Repressor gene

that gene which represses the operator gene.

Resilience

the capacity of the ecosystem to fluctuate between given limits and thereby restore itself to its original state after disturbance. Such capacity operates within certain limits, beyond which the system is not able to return to the condition of pre-disturbance and, hence, is degraded towards pioneering successional states. The limits of resilience differ for different ecosystems, as does the speed of recovery. (See also Stability.)

Resistance

that characteristic of a host plant that enables it to prevent or delay the development of a pathogen or other harmful factor. (See also Susceptibility.)

Restriction enzymes

enzymes that bacteria synthesize in defence against the invasion of foreign DNA from, for example, bacteriophages, thereby degrading that DNA while remaining themselves protected through particular methylations. A restriction enzyme always divides the DNA in the same site, specific loci, or targeted sequences. Their scissor-like behaviour opened the doors to genetic engineering.

RFLP or restriction fragment length polymorphism

polymorphism along the length of restriction fragments.

Rhizome

an underground stem that is usually horizontal and elongated. It differs from a root by the presence of nodes and internodes, sometimes scale-like leaves, and shoots in the nodes themselves.

Ribonucleic acid

see RNA.

Ribosomes

small cellular organelles found in all living beings where protein synthesis is carried out.

Risk

the possibility or probability that a future harm will happen.

RNA or ribonucleic acid

nucleic acid formed by nucleotides in which the sugar is ribose, and the nitrogen bases are adenine, uracil, cytosine, and guanine. They act as intermediaries and complement the genetic instructions coded in the DNA. Several different types of RNA exist, related to protein synthesis; these are messenger RNA (mRNA, ribosomal RNA (rRNA), transfer RNA (tRNA), and heterogeneous nuclear RNA (hnRNA). RNA is normally the product of the transcription of DNA template, although, in retroviruses, RNA acts as the template and DNA is the copy.

Root

the descending portion of the plant, fixing it in the soil. It also absorbs water and minerals and has a characteristic arrangement of vascular tissues.

Ruderal

(*adj.*) said of environments and plant and animal species that are linked to human activities, either directly or indirectly.

Runner

see Stolon.

S

S₀

the symbol used to designate the original self-fertilized plant.

S₁, S₂, etc.

symbols used to designate the first self-fertilization (progeny of plant S₀), second self-fertilization (progeny of plant S₁), etc.

Sahel

a transitional zone lying immediately south of the Sahara Desert that is transitional between the northern desert and the southern savannah. It is a semi-arid zone of short grasslands with acacia. (See also Grassland.)

Savannah

a large region of Africa that lies between the Sahel and the belt of tropical moist broadleaf forests near the equator. Two forms are recognized: the **Sudanian savannah** (also called Sudan—unrelated to the nation of the same name), which is a belt of tall grasslands, and the **forest-savannah**, which is a transitional zone between the grasslands and the belt of tropical rainforests. (See also Grassland.)

Scarification

any process to rupture, scratch, or mechanically alter seed coats to make them permeable to water or gases.

Scrub

see Shrublands.

Secondary consumers, also heterotrophs

these feed on the primary consumers. This level is composed of carnivores. (See also Primary producers.)

Secondary production

this represents the speed of storing energy at the levels of consumers and decomposers. It is therefore the increase in biomass per unit of time and space at these levels.

Seed

a mature ovule with its embryo and all the normal seed coats. In some plants, the seed also has an endosperm.

Seed tubers or seed pieces

small tubers or cut pieces of tubers used for planting new-season crops. They are stored during winter and later transplanted for seed production. Seed tubers are obtained from plants that have not been thinned. Seed pieces are obtained by cutting up tubers so that each piece carries an eye or set of eyes that, on planting, will grow into a new plant, as in potato.

Segregation

the separation of homologous chromosomes (and, consequently, their genes) of the different parents during meiosis.

Selection

(a) Any natural or artificial process that permits an increase in the proportion of certain genotypes or groups of genotypes in successive generations. (b) A plant or line that originates from a selection process. Types of selection include mass selection, natural selection, progeny selection, reciprocal recurrent selection, and recurrent selection.

Self-fertile

(adj.) in plants, able to become fertilized and produce seeds after self-pollination. (See also Self-sterility.)

Self-fertilization

in plants, the fusion of an ovule with the sperm cell of the same flower, another flower of the same plant, or clone. (See also Autogamy.)

Self-fertilized line

(a) A pure line that usually originates from self-pollination and selection. (b) The product of self-fertilization.

Self-incompatibility

see Self-sterility.

Self-pollination

in plants, the process whereby pollen is transferred from the anther to the stigma of the same flower, another flower of the same plant, or clone. (See also Cross-pollination.)

Self-sterility or self-incompatibility

in plants, the incapacity, usually physiological, to incur fertilization and produce seeds after self-pollination. (See also Self-fertile.)

Sexual cells

see Gametes.

Sexual reproduction

reproduction on the basis of germ cells and the fusion of gametes. (See also Vegetative propagation.)

Shoot

(a) In vascular plants, that part derived from the plumule (being the stem) and usually leaves. (b) A sprouted part, branch, or offshoot of a plant. (See also Crown; Sucker.)

Shrublands or scrub

a type of plant community in which dominate shrubs that are usually highly branched at the base. It is typical of semi-arid and arid areas.

Simple sequence repeats

see Microsatellites.

Somaclonal variation

the variation observed in somatic cells, which divide mitotically in tissue culture. Depending on the species, this variation may be genetic, phenotypic, or in habitat. Many of these modifications are transferred to progenies of regenerated plants.

Somatic

(*adj.*) refers to diploid cells, normally with one set of chromosomes from the male parent and another set from the female parent.

Somatic embryos

those embryos that originate from the fusion of somatic cells, that is, not from gametes.

Speciation

the formation of one or more new species from one already existing. It occurs when an isolated population develops certain distinctive characteristics as a result of natural selection and loses the possibility of reproducing with the rest of the population, even when no geographical or physical reasons are apparent to prevent it.

Species

(a) A taxonomic class formed by the set of natural populations that can cross among themselves, whether in fact or potentially. That is, determined empirically, two individuals belong to the same species if they can generate reproducible offspring; otherwise, they are of different species. **(b)** A unit of classification that is a subdivision of a genus. **(c)** A group of closely related individuals and descendants of common origin. (See also Speciation; Taxon.)

Specific (*adj.*)

(a) Related to species. **(b)** Also said of the characteristic effect on the cells or tissues of members of a given species or which interacts with them, for example, of infectious agents.

Sperm cell

in plants, part of the male gametophyte. The germ cell in the pollen grain undergoes mitosis to produce two sperm cells, one of which will fuse with the egg in the ovule to form the zygote. The other sperm cell will fuse with the two polar cells in the ovule to form the endosperm that later feeds the embryo. (See also Egg.)

Spike

also known as **ear** or **tassel**: an inflorescence with a more-or-less elongated axis, throughout which the flowers are almost sessile.

Spikelet

a unit of a spike, that is, of an inflorescence typical of grasses. It is formed by glumes, the rachis, and florets.

SSRs

see Microsatellites.

Stability

the ability of ecological systems to persist over time despite external disturbances, whether of natural or anthropic origin. (See also Resilience.)

Stamen

in plants, the male reproductive organ of the flower that comprises the anther and filament.

Staminate flower

a flower that bears stamens but has no pistils. (See also Pistillate flower.)

Static conservation

the type of conservation that stops the natural processes of evolution and co-evolution of genetic resources, hence conserving them in isolation and outside their natural habitats. The term is applied specifically to ex situ conservation.

Stem

the main axis of a vascular plant. It bears buds, leaves or scale leaves, and reproductive structures such as flowers. It is usually borne above ground and has a characteristic arrangement of vascular tissue. (See also Bulb; Corm; Crown; Rhizome; Stolon; Tuber.)

Steppe

(a) A term that, in its etymology, has a strong geographical sense, usually including the concept of desert with very cold winters. (b) In its strictly botanical meaning, it corresponds to grassland plant formations found in cold high areas of Asia where cespitose plants dominate, forming patches and leaving exposed areas. It includes other short plants that are perennial, herbaceous, or woody in nature. The exposed areas may be temporarily occupied by annual plants. (See also Grassland.)

Sterility

the impossibility of completing fertilization and acquiring seed because of defective pollen or ovules, other aberrations, or unusual or seasonal plant activity.

Stigma

in flowering plants, that part of the pistil that receives pollen.

Stolon or runner

(a) A specialized creeping stem, capable of forming roots and shoots at its nodes. (b) Specifically, those prostrated or scattered stems that develop in leaf axils in the crown of the mother plant, grow horizontally over the ground, and form new plants from its nodes.

Strain

in microbiology, that set of viruses, bacteria, or fungi that have the same gene pool.

Structural gene

(a) That gene which regulates the formation of an enzyme or other protein required for a cell's structure or metabolism. (b) In evolutionary terms, that gene of ancient origin that contributes to the basic structure of a life form (a). (See also Evolution.)

Style

in flowering plants, the column that connects the ovary to the stigma.

Subculture

the aseptic transfer of part of a plant in a collection to a fresh medium for renewal and strengthening.

Sucker

(a) A shoot that originates in a plant but from under the soil surface. This term is more precisely used to designate a shoot that originates from an adventitious bud on a root.
(b) Loosely, the term also refers to shoots originating close to the crown, even though they arise from stem tissue.

Susceptibility

the extent to which a plant, vegetation complex, or ecological community would suffer if it were exposed to a pathogen or other harmful factor (regardless of whether it receives such exposure). A host plant is said to be **susceptible** if it cannot prevent or retard the harmful effect of a pathogen or other noxious factor. (See also Resistance.)

Sustainability

the concept of using resources, while renewing them in a given period.

Sustainable development

'Sustainable development is that development that serves the needs of the present generations without undermining the needs of future generations' (Brundtland Report 1986). 'It is a process of sustained and equitable improvement of the quality of life, based on the conservation and protection of the environment in such a way that it does not compromise the expectations of future generations' (Law 19,300, Colombian Congress).

Sustainable use

the use of components of biodiversity in such a way and at such a rate that it does not cause long-term reduction of biodiversity, thereby maintaining the possibilities of meeting the needs and aspirations of current and future generations.

Synthetic variety

advanced generations of seed mixtures of free pollination from a group of lines, clones, or self-fertilized lines, or of hybrids among them.

System

a coherent set of interacting elements that can be isolated from the rest of the universe according to appropriate criteria.

Systematics

the study of systems, from both the abstract and applied viewpoints.

T**Tassel**

see Spike.

Taxon (pl. taxa)

a taxonomic group (e.g., species, genus, or family) at any level within a classification system of living beings that are thought to have certain similarities and a given degree of evolutionary relatedness. Taxa are typically organized hierarchically from the largest categories (e.g., kingdom, division, or class) where the members are less related to the smallest (e.g., species, subspecies, or variety), where the members are closely related.

Test cross

that process whereby a hybrid is crossed with one of its parents, or with a genetically equivalent recessive homozygote. The test is used to prove homozygosis or linkage.

Tetraploid

an organism that has four sets of chromosomes, that is, a chromosome number of $4n$. (See also Ploidy level.)

Thermotherapy

in plants, a treatment to disinfect plant material, using heat. For cassava, for example, the treatment consists of taking selected stem cuttings to the greenhouse or growth room and subjecting them to 3 weeks of temperatures at 40°C during the day and 35°C during the night, and a daylength of 12 hours. To increase effectiveness, the treatment is combined with in vitro tissue culture.

Tiller

see Offshoot.

Totipotent

(*adj.*) capable of anything. Said of cells that can give rise to cells of any kind.

Toxins

(**a**) Substances, usually albuminoid, made by living beings, especially microbes, that act as poisons, even in tiny quantities. (**b**) Proteins responsible for particular functions in certain bacteria and which are poisonous to certain other organisms.

Trait, character, or characteristic

(**a**) A plant's structural or functional attribute that results from interaction among genes and with the environment in which the plant develops. (**b**) A distinctive trait that is the expression of a gene. (**c**) The expression of a gene as manifested in a phenotype.

Transcription

the biosynthesis of an RNA molecule by polymerizing complementary nucleotides to a DNA sequence. This RNA molecule is a precursor of messenger RNA (mRNA) and represents a true copy of the complementary DNA sequence from which it has been transcribed. A specific sequence placed in front of the gene (promoter) acts by identifying the initiation site for transcription. In RNA, uracil (U) occupies the positions that thymine (T) has in DNA. It is the working copy of given DNA segments.

Transformation

(**a**) In bacteria, one of the natural processes, together with conjugation and transduction, for transferring genetic material from one bacterium to another, involving the direct integration of DNA. (**b**) Experimentally, it consists of introducing a DNA fragment into a bacterium to stimulate genetic recombination. (**c**) By extension (and loosely), the term sometimes designates an identical process that affects eukaryotic cells (yeasts, animal, and plant cells).

Transgene

a gene has been introduced from another species such that it can usually be transmitted to that organism's offspring.

Transgenesis

the artificial introduction of new genetic material into the genome of a plant through genetic engineering such that this new material can be inherited by progeny. This technique permits associations of genes that do not exist in nature, as they have been made to jump barriers between species and even higher taxa such as kingdoms.

Transgenic plant

(a) A plant carrying a transgene. **(b)** That plant whose genome has been altered by *in vitro* manipulation.

Translation

an exchange of information contained in the sequence of the four nucleotides of mRNA due to the arrangement of the 20 amino acids in the structure of polypeptide chains. Each amino acid unites with a small specific RNA molecule, designated as transfer RNA (tRNA), and which serves to identify it. This molecule transfers the free amino acids from the solution to the point of formation of the polypeptide chains when so indicated by instructions contained within the messenger RNA (mRNA) molecule.

Translocation

the structural modification of chromosomes by which a chromosomal segment changes its relative position within the chromosome itself (**intrachromosomal translocation**) or between chromosomes (**interchromosomal translocation**). (See also Transposition.)

Transposition: **(a)** The change of position of given pairs of bases in the DNA sequence.

(b) The translocation of a chromosomal segment to another position within the same chromosome. (See also Translocation.)

Transposon

a mobile genetic element with a defined DNA sequence and which can be transferred to new positions in the cell's chromosome without losing the copy in its original position. Moreover, it behaves as a true intracellular parasite. Transposable elements of eukaryotes are grouped into two categories, according to their mechanism of transposition: class 1 (**retrotransposons**), which jump to the genome through an intermediate step, that is, through RNA and with the intervention of the enzyme known as inverse transcriptase; and class 2, which transpose directly from one chromosomal site to another by means of a different enzyme (transposase).

Trihybrid

the result of one cross between parents that differ in three specific genes.

Triploid

(a) An organism which has three sets of chromosomes, that is, a chromosome number of 3n. **(b)** (*adj.*) Having three sets of chromosomes. (See also Ploidy level.)

Tuber

a modified stem structure that develops underground as a consequence of swelling in the subapical part of a stolon and the subsequent accumulation of reserve materials.

V

Variety or cultivar

among cultivated plant species, **(a)** that plant which differs by one or more traits. When it reproduces by seed or asexually, these traits are conserved. **(b)** Taxonomically, a subdivision of a species. **(c)** Agronomically, a group of similar plants that, by structure and performance, may differ from other varieties within the same species. (*See also* Obsolete variety; Synthetic variety.)

Vascular bundles

structures that are present in higher plants and whose function is to transfer liquids through modified canals.

Vector

a carrier, that is, that which transfers an agent from one host to another. **(a)** A system that permits the transfer, expression, and replication of foreign DNA in host cells for later cloning or transgenesis. It involves a DNA molecule (bacterial plasmid, artificial microsome of yeast, or bacterium) or a defective virus. **(b)** By extension, a vector is the entire system of gene transfer, for example, a synthetic system like that of liposomes.

Vegetation

that spatial structure or mode of organization of the set of plant species found in a given place. It is usually described by examining stratification and coverage, alluding to the species present and the dominant forms of life.

Vegetative propagation, clonal multiplication, asexual reproduction, or agamic reproduction

a type of reproduction that does not involve the formation and fusion of gametes, leading to the constitution of homogeneous clones. (*See also* Apomixis; Sexual reproduction.)

Veldt or veld

open temperate grasslands found in southern Africa. (*See also* Grassland.)

Vernalization

that treatment of plants with heat or cold to modify successive stages leading to maturity. For some species, vernalization can be achieved by exposing germinating seed at temperatures slightly above freezing point.

Viability

(a) The capacity of an organism to continue living after birth. **(b)** In seeds, the capacity to germinate when they possess all they need to do so. The fact that a seed is alive does not guarantee that it will germinate, even under optimal conditions, as phenomena such as dormancy or inactive states can occur.

Virion

the extracellular form of the virus, that is, before it has entered the host cell to replicate.

Viroids

causal agents of certain plant diseases. Their name derives from their similarity to viruses, from which they are differentiated by a lack of a capsid.

Virulence

the relative capacity of a pathogen to incite disease.

Virus

an infectious cell-free entity that, even though it can survive extracellularly as a virion, is an obligate parasite because it can replicate only within specific live cells, generating no energy or metabolic activity. The permanent components of a virus are nucleic acid (DNA or RNA, single or double stranded) and a protein coat known as capsid. In some cases, these basic structures have an outer lipid membrane or envelope (also called peplos), which sometimes also carries glycoprotein spikes.

Voluntary release of GMOs

the deliberate introduction of a GMO or combination of GMOs into the environment without measures of containment such as physical barriers or a combination of these with chemical or biological barriers having been adopted to limit the GMOs' contact with the human population and the environment.

Vulnerable

a category of conservation status, describing taxa that are believed to become at risk of extinction should the causal factors of threat continue operating. Such taxa include those for which most or all their populations are diminishing due to overexploitation, widespread habitat destruction, or other environmental alterations; or whose populations have been seriously exhausted and whose definitive protection is still not ensured; or whose populations are still abundant, but are under threat from severe adverse factors throughout their area of distribution. Vulnerable taxa are those whose populations have been reduced to such critical levels or whose habitats have been so drastically reduced that they are at imminent risk of extinction. (See also Categories of species conservation.)

W**Weeds**

- (a) In agriculture, plants or species that grow where farmers do not want them.
- (b) In ecology, plants that have adapted to disturbed environments or open habitats.

Wild species

those groups of organisms that are regularly found in nature and have not been domesticated.

Wild type

in genetics, a species or organism that carries the normal form of a gene or genes, as opposed to a mutant.

Working collection or breeder's collection

that collection of germplasm accessions used for crop research and improvement. (See also Active collection; Base collection; Core collection.)

X**Xenia**

the immediate effect of pollen on the characteristics of endosperm.

Z**Zygote**

the cell that results from the fusion of gametes.

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