GLOSSARY

Abscisic acid

Plant hormone (ABA) promoting leaf fall and senescence.

Adventitious roots

Secondary rooting system produced by vegetative (root, stem or leaf derived) structures.

Aleurone layer

Thin layer of protein-containing tissue lining the seed coat. It stabilises pH and secretes enzymes to trigger germination.

Alkaloid

Organic nitrogenous compound produced by plants for defence against pests and pathogens e.g. theophylline (tea), theobromine (cocoa), caffeine and nicotine. Many, such as vincristine, reserpine and quinine are used as medicines.

Allelochemicals

Toxic compounds produced by plant roots to suppress competition from other plants.

Annuals

Plants that complete their entire life cycle in one year.

Apomixis

The formation of viable embryos from unfertilised egg cells or other cells in the ovule. This is common in citrus fruits.

Apoplastic pathway

Route by which water travels through cell walls along the water potential gradient.

Auxin

Plant hormone (indole acetic acid, IAA) promoting root and shoot growth and suppressing lateral bud development.

Axillary bud

A bud formed in the angle between the stem and a lateral leaf shoot.

Biennials

Plants that complete their life cycle from germination to seed production in two years.

Bioaccumulation

The multiplication of pesticide concentrations in food chains due to the pyramid of numbers effect. Particularly acute in long aquatic food chains.

Bloom

Term used in horticulture to describe a stem bearing a single flower. (as opposed to 'spray' which describes a single stem bearing a multiple flower head)

Bordeaux mixture

Fungicide containing copper sulphate and calcium hydroxide, traditionally used in French vineyards.

C4 photosynthesis

Process in which the light dependent and non-light dependent reactions of photosynthesis are separated to minimise losses from photorespiration.

Callus

Mass of undifferentiated cells.

Cambium Meristematic tissue giving rise to phloem and xylem (sometimes called lateral meristem).

carpel

Female sexual organ of a flowering plant.

Caryopsis

Grass or cereal seed surrounded by remains of the ovary.

Cash crop farming

Agricultural practice specialising in a limited number of crops.

Casparian strip

Waterproof layer in the walls of root endodermal cells preventing the apoplastic movement of water.

Celluloid

Hard material made from cellulose nitrate, used to make billiard balls and piano keys.

Cellulose

A structural carbohydrate (beta glucose polymer) forming micro and macro-fibrils, forming the meshwork of plant cell walls. Indigestible by most animals.

Chemosynthesis

Process by which microorganisms manufacture organic molecules from inorganic raw materials using energy from chemical process (rather than the sun).

Chitting

The use of short bursts of light to promote sprouting in potato tubers.

Chlormequat

A growth regulating chemical used to suppress apical dominance in cereal crops.

Clone

A genetically identical copy. The term can be applied to tissue cultures or whole organisms.

Colchicine

Mutagenic agent used to produce double haploid (dihaploid) plants.

Compensation point

Zero position at which respiratory loss equals photosynthetic gain.

Competency

The potential of an explant culture to develop in a particular, desired way.

Conidium

A multinucleate reproductive structure formed from a single sporangium, which breaks off the parent organism (fungus).

Cotton boll

Fruit capsule of cotton flower containing about 30 seeds.

Cotyledon

'Seed leaf'. One (monocotyledons) or two (dicotyledons) of these structures may develop within the seed, absorbing nutrients from the endosperm and supplying food for germination.

Crop rotation

Agricultural practice whereby soil fertility is maintained through planting different crops in sequence including 'fallow' periods with nitrogen fixing plants such as clover or alfalfa.

Cross pollination

The transfer of pollen between genetically different parent plants.

Cryopreservation

Rapid cooling (to minus190 degrees Centigrade) for germplasm storage.

Cultural control

Agricultural practice by which natural predators are encouraged to multiply in protected areas such as hedgerows, grass banks and wildflower reservoirs.

Cybrid

Cell resulting from the fusion of mitochondrial genomes (not the nuclei) of two different parent cells.

Cytokinin

Plant hormone promoting cell division.

Damping off

Fungal disease affecting the stem base of young seedlings causing them to keel over.

Dark respiration

Loss of assimilated photosynthetic products due to night time respiration, the rate of which is largely dependent on temperature.

Deamination

Breakdown of amino acids producing ammonia (ammonification).

Denitrifier

Microorganism using soil nitrate as a source of oxygen whilst releasing gaseous nitrogen into the atmosphere.

Determination

The stage in differentiation where the endpoint (final form) is fixed.

Differentiation

The process whereby cells become specialised. De-differentiation and re-differentiation are terms used to describe processes in micropropagation.

Dihaploid plant

Uniformly homozygous, pure-breeding plant produced by treating a haploid plant with a chemical mutagen (colchicine) to double the gene set. Used in plant breeding to produce hybrid varieties.

Dioecious

Male and female flowers develop on separate plants e.g. eucalyptus, hemp.

Diuron

Systemic, broad spectrum herbicide used to prepare weed-free soil in nurseries.

Egg nucleus

The female gamete of a flowering plant. It is one of 8 nuclei in the haploid embryo sac.

Electrofusion

Technique whereby cells from different plants are induced to conjugate using electrodes.

Electroporation

Technique for DNA transfer through pores in plant protoplast membranes.

Embryo sac

A haploid structure, which develops by mitotic divisions from a single haploid cell in the ovule. It contains the egg nucleus (female gamete) and polar nuclei.

Embryogenesis

The development of an embryo from a fertilised egg.

Endosperm

Triploid (3n) food storage tissue in the seed of a flowering plant. It is often absorbed into the cotyledons.

Epicotyl

Embryonic shoot

Epigeal germination

Cotyledons remain below ground during germination e.g. broad bean.

Ethephon

Chemical used to promote ethene production, used to synchronise fruit ripening in crops such as pineapple.

Ethene

Naturally occurring plant hormone, promoting fruit ripening.

Evapo-transpiration

Loss of water by evaporation from the soil surface and leaves of plants.

Explant

Small piece of a selected plant excised for micropropagation.

FACS

Fluorescence activated cell separator used to separate the products of animal cell fusions.

Ferrodoxin

Small protein complexed with iron and sulphur

Fibres (plant)

Plant cells with thickened and lignified walls found in tissues specialised for transport and support.

Field capacity

The maximum volume of water which can be held in the soil. It is determined by the opposing forces of capillarity and gravity.

Field rate

Term used to describe the volume / concentration of an agrochemical (e.g. herbicide) applied to a particular crop.

Flocculation

Aggregation of soil particles to form soil crumbs.

Floret

Tiny individual flower (term generally applied to grasses and cereals).

Gall

Swollen area (tumour) of a plant caused by uncontrolled cell division

Gibberellin

Plant hormone (gibberellic acid, GA) promoting stem elongation and germination of seeds.

Ginning

The separation of cotton seeds from the lints and linters.

Glume

A stiff leaflet protecting the flower bud of a grass or cereal plant.

Glyphosate

Systemic, broad spectrum herbicide selectively applied to individual plants.

Golden rice

Genetically modified strain of rice containing a promoter which switches on the gene necessary for producing beta carotene (vitamin A).

Halophyte

Plant adapted to salty conditions e.g. salt marsh.

Haustorium

Feeding hypha of a parasitic fungus which penetrates the cells of its host plant.

Heartwood

Central region of non-functioning darker wood in older trees filled with excretory materials.

Hedgerow

A strip of natural vegetation separating crops, acting as a wildlife corridor and a reservoir of natural predators.

Heel and mallet

Term used to describe a straight cutting with parts of the current and previous year's growth.

Herbaceous

Term used to describe non-perennial plants without woody parts.

HEPA filter

'High Efficiency Particulate Air' filter used to avoid contamination in laboratories.

Hermaphrodite

A bisexual organism capable of producing male and female gametes.

Heterozygosity

Condition of a genotype where many alleles exist in their alternate forms

Homozygosity

Condition of a genotype where few alleles exist in their alternate forms. The organism tends to be pure-breeding.

Hybrid

A plant resulting from cross-breeding two parents of distinct genotypes.

Hybrid vigour

Strong growth and development characteristic of plants with mixed alleles.

Hydroponic

Soil free cultivation of plants.

Hypha

Feeding branch of fungal mycelium.

Hypocotyl

Embryonic root

Hypogeal germination

Cotyledons rise above ground during germination e.g. castor oil.

Imbibition

The uptake of water by a seed driven by electrostatic forces between water molecules and stored colloidal materials in the endosperm.

Inbreeding depression

A decline in vigour in plants bred for uniformity.

Inflorescence

A cluster of individual flowers on a single flowering stem.

Integrated crop management

Agricultural practice combining chemical, organic and cultural methods to minimise losses from pests whilst conserving the environment and encouraging biodiversity.

Intercropping

Agricultural practice whereby a secondary crop is cultivated in the spaces between the primary crop e.g. groundnuts in a coffee plantation.

In vitro

Literally 'in glass'. Used to describe developmental work with living organisms outside the body (animals) or soil (plants); cf. *ex-vitro* 'out of glass' implying for plants 'in soil'.

Leghaemoglobin

Iron containing pigment occurring in the roots of leguminous plants, acting as a store of oxygen for nitrogen fixation.

Legumes

Plants that produce fruits in the shape of pods, e.g. bean, pea, clover, tamarind tree.

Lemma

Lower 'sepal' of a grass or cereal floret.

Light saturation point

Maximum value for photosynthesis when all other conditions are at optimal values.

Lignin

Hard, waterproof material (a cross-linked phenol polymer) deposited in the cellulose meshwork of plant cell walls for mechanical strength.

Linters / lints

Hairs attached to cotton seeds for dispersal. Linters are short and fluffy. They are used for cellulose-based products. Lints are longer and spun into cotton thread.

Lodicules

A pair of swellings at the base of a grass or cereal floret storing water.

Macronutrient

Elements such as nitrogen, phosphorus and potassium required in amounts up to 150kg. per hectare; cf. micronutrients required in trace amounts.

Maleic hydrazide

Chemical spray used to inhibit apical dominance and promote lateral spreading of fruit trees.

Malting

Process in brewing in which barley is germinated.

MCB generator

Fungicide preventing the formation of microtubules needed for spindle formation in nuclear division.

Medullary ray

Loosely packed areas of large parenchyma (storage) cells arranged radially in secondary xylem tissue.

Meristem

Tissue composed of actively dividing stem cells. Apical meristem – found at tips of growing shoots and roots; lateral meristem (vascular cambium) – located in the transport tissue between phloem and xylem.

Microinjection

Technique for the insertion of DNA directly into the nucleus of a host cell.

Micropropagation

The process by which plants are propagated vegetatively using very small parts (explants).

Micropyle

Small opening in the wall of a plant ovary through which fertilisation occurs.

Middle lamella

Visible boundary between adjacent plant cells filled with glue-like pectin.

Monoculture

Agricultural practice, growing a single crop over a large area.

Monoecious

Male and female flowers develop on separate stems of the same plant e.g. maize.

Monogenic resistance

Pest resistance conferred by the possession of single gene; cf. polygenic resistance (controlling the expression of a number of features).

Mycelium

Network of microscopic fungal filaments.

Neolithic

'New stone age', settled agricultural lifestyle originating around 15000 years ago.

Neolithic revolution

The transition from nomadic hunter-gathering to settled agricultural communities causing a dramatic population explosion.

Nitrogen fixation

Process whereby atmospheric nitrogen is incorporated into inorganic nitrogen-containing molecules e.g. nitrate. It occurs in the industrial Haber process and nitrogen fixing bacteria, also lightning.

Node

Swollen part of the stem where leaf buds form.

Nodulin genes

Genes coding for proteins such as leghaemoglobin, essential to nitrogen fixation.

Nucellus

Food storage tissue surrounding the embryo sac. It is absorbed into the endosperm following fertilisation.

Nutrient film technique

Hydroponic system in which plants are grown in gullies made from plastic film.

Oncogene

Tumour-promoting gene.

Opine

Amino acid derivative coded for by *Agrobacterium* genes.

Oospore

Resistant, dormant reproductive structure formed as a result of a sexual process (conjugation) in fungi e.g. *Phytophthora.*

Organochlorines

See also organophosphates. Contact insecticides including DDT, dieldrin, parathion and malathion, widely used as spays.

Organogenesis.

Development of plant organs from an undifferentiated mass of cells.

Ovary

Part of the carpel containing the ovules. It may be fleshy, woody or pod-like and becomes the fruit after fertilisation.

Ovule

Not to be confused with 'egg'. It is a female reproductive structure occurring singly or with others in the ovary of a flowering plant. It contains the embryo sac protected within a double wall of integuments.

Paleolithic

Term used to describe cave dwelling, hunter-gathering lifestyle; literally 'old stone age'

Palea

Upper 'sepal. of a grass or cereal floret.

Paraquat

Contact, broad-spectrum herbicide used to clear paths

Parenchyma

Plant tissue composed of large, thin walled cells for storage.

Paris green

Arsenic based insecticide.

Parthenocarpy

Development of an ovary to form a fruit in the absence of fertilisation.

Parthenogenesis

The production of offspring from unfertilised eggs e.g. aphids.

Pectin

Sticky material, which binds plant cells together at the middle lamella.

Perennials

Plants which live for more than two years.

Pericarp

Fruit wall.

Permanent wilting point

The percentage of water per dry mass of soil below which plants will not recover from water stress.

Persistent (insecticide)

Insecticide which is not easily broken down in the environment.

Phenotype

The sum of observable characteristics (internal and external) of an organism resulting from the interaction of genes and environment; cf. genotype, the actual allelic composition.

Phloem

Transport tissue specialised for the movement of sugars and assimilates throughout the plant.

Photoperiodism

The response of plants to changes in day length.

Photorespiration

A wasteful process in the photosynthetic pathway in which oxygen, not carbon dioxide combines with RuBP, reducing the output of the Calvin cycle.

Phototropism

Growth response of plants to light.

Physiological drought

The loss of water uptake through plant roots caused by a lack of oxygen. Oxygen is required for active ion transport mechanisms needed to establish a water potential gradient.

Phytochrome

Light absorbing pigment in leaves with two forms (red and far red) responsible for the detection and measurement of day length.

Plasmid

Small loop of DNA used by bacteria to exchange genetic material.

Plumule

Embryonic shoot apex.

Polar nuclei

A pair of nuclei in the embryo sac. They fuse with a single male nucleus at fertilisation to form a triple fusion (3n) nucleus which develops into the food store (endosperm).

Pollen

Not to be confused with 'male gamete' or 'sperm'. It is a haploid structure containing 3 nuclei (2 male nuclei and a pollen tube nucleus) within a protective wall.

Pollen tube

A haploid (n) structure which germinates from the pollen grain when it lands on a receptive stigma. It carries two male nuclei.

Polyembryony

The development of multiple embryos from unfertilised ovule cells.

Polyploid

An organism with multiples of the chromosome set e.g. 3n, 4n.

Pirimicarb

Selective insecticide, toxic to flies but harmless to mammals and a number of insect predators.

Proembryo

Undifferentiated cell mass formed by dividing zygote.

Productivity

Gain in plant dry mass per square meter of land surface.

Protandry

Anthers develop before the carpels preventing self-pollination.

Protogyny

Carpels develop before the anthers preventing self-pollination.

Protoplast

Term used to describe a naked plant cell i.e. one with the cell wall removed.

Pyrethrum

Contact insecticide.

Rachis

Main axis of the flower stalk in a grass or cereal plant.

Radicle

Embryonic root apex.

Recombinant DNA

DNA containing genes from two or more different organisms. An organism with recombinant DNA is said to be 'transformed'.

Rescued embryo technique

The excision of an unfertilised embryo from a plant ovary for micropropagation.

Residual (insecticide)

Insecticide which is not broken down or excreted by the body of the insect, becoming increasingly toxic at each contact and accumulating in the food chain.

Endonuclease restriction enzyme

Enzymes (naturally occurring in microorganisms) used to cut DNA at specific base sequences leaving uneven (sticky) ends.

Retting

The removal of soft tissues in plant stems by soaking in a chemical bath e.g. in linen production.

Rhizome

Plant stem growing horizontally below the soil surface giving rise to new plantlets as a means of vegetative reproduction e.g. couch grass.

Rootstock

Rooting part of a grafted plant e.g. citrus fruit buds are grafted onto Seville orange rootstocks.

Saprotrophic

Term used to describe an organism that derives its nutrients from dead or decaying organic matter e.g. fungus.

Sapwood

Younger, outer region of xylem in trees, functioning for water and mineral ion transport.

Scarification

Scratching the waxy protective cuticle of the seed coat to stimulate germination.

Scion

Short piece of detached shoot containing one or more dormant buds.

Sclerechyma

Plant tissue consisting of supporting cells, mostly fibres.

Scutching

The mechanical separation of woody plant fibres.

Secondary growth

The expansion of woody stems in perennial plants by the growth of additional layers of xylem, phloem and supporting tissues.

Selective breeding

Artificial breeding between individuals chosen for specific characteristics repeated over many inbred generations.

Self-incompatibility

Process whereby hermaphrodite plants prevent self-pollination / fertilisation.

Self pollination

The transfer of pollen from stamen to stigma of the same plant.

Seminal roots

Primary rooting network of a germinating seed.

Shifting cultivation

The temporary clearance of land for agricultural crops, leaving it to return to its natural vegetation after the loss of fertility.

Shive

Shredded wood used for composition boards.

Solanine

A toxic alkaloid produced by members of the potato family as an insect repellent.

Somaclonal variation

Genetic variation occurring naturally in cloned cells.

Somatic embryogenesis

Process whereby non-sexual (somatic) cells are induced to behave in an embryonic fashion. Can be used to produce artificial 'seeds'.

Somatic hybridisation

Fusion of cells from different organisms to produce a hybrid.

Somatoplastic sterility

Failure to form the triple fusion nucleus in fertilisation resulting in the loss of endosperm and preventing the development of the zygote.

Spike

The inflorescence of a grass or cereal plant.

Sporangium

Spore producing structure e.g. fungi, mosses, ferns.

Sporangiophore

Fungal hypha bearing a sporangium

Spore

Non-sexual reproductive structure produced for dispersal.

Stamen

Male sexual organ of a flowering plant.

Stigma

The part of a carpel receptive to pollen grains.

Stolon

Plant stem growing horizontally above the ground producing new plantlets as a means of vegetative reproduction e.g. strawberry.

Suspension culture

Multiplication of undifferentiated cells in a constantly agitated solution as opposed to a solid mass (callus).

Strip farming

Agricultural practice whereby crops are interspersed with strips of natural vegetation acting as mini-hedgerows encouraging natural predators.

Symplastic pathway

Route by which water travels along the water potential gradient through the cytoplasm and sap vacuoles.

Tap root

Principle root, swollen with food for vegetative propagation e.g. carrot.

Testa

Seed coat

Tillage

Weeding and aeration of soil.

Tiller

Flower bearing side shoots in grasses and cereals.

Tissue culture

In vitro cultivation of tissues in sterile media.

Totipotent

Term used to describe the potential of meristematic cells to develop into any plant tissue type.

Tracheid

Xylem cell with oblique end walls and narrow lumen.

Transamination

Process whereby amino acids are converted from one form into another

Trap crop

Small area reserved in cultivated fields for plants, which attract pests away from the crop e.g. brome grass in wheat crop.

Tuber

Underground swollen stem acting as a food storage organ for vegetative reproduction e.g. potato.

Vector

Biological carrier e.g. whitefly is a vector of a plant virus.

Vegetative propagation

The multiplication of plants from non-flowering structures; an asexual process resulting in cloned offspring.

Vernalisation

The response of plants to a period of cold.

Vessel element

Xylem cell with no end wall and wide lumen, which forms a component of a continuous tube (xylem vessel). Absent in coniferous trees.

Viavax

Systemic fungicide causing destruction of fungal mitochondria.

Vincristine

See also vinblastine. Alkaloid produced by periwinkle plants used to produce drugs which suppress the development of cancerous tumours.

Viviparous

Mode of reproduction whereby females give birth to live offspring; cf. egg laying (oviparous).

Wheastrol

A bi-product of the brewing industry used to attract aphid predators to sites of pest infection.

Xylem

Transport tissue specialised for the passive movement of water and mineral ions from the soil to all parts of the plant.

Zoospore

Motile swimming spore (with flagellum).