متون تخصصی زبان انگلیسی

برای دانشجویان رشته‌های

کشـــاورزی

〔1〕

اکبر فخـــری

Contents

Phonetic Symbols

Consonants

1	/p/	as in	**pen** /pen/
2	/b/	as in	**big** /bɪg/
3	/t/	as in	**tea** /ti:/
4	/d/	as in	**do** /du:/
5	/k/	as in	**cat** /kæt/
6	/g/	as in	**go** /gəʊ/
7	/f/	as in	**four** /fɔ:/
8	/v/	as in	**very** /'veri/
9	/s/	as in	**son** /sʌn/
10	/z/	as in	**zoo** /zu:/
11	/l/	as in	**live** /lɪv/
12	/m/	as in	**my** /maɪ/
13	/n/	as in	**near** /nɪə/
14	/h/	as in	**happy** /'hæpi/
15	/r/	as in	**red** /red/
16	/j/	as in	**yes** /jes/
17	/w/	as in	**want** /wɒnt/
18	/θ/	as in	**thanks** /θæŋks/
19	/ð/	as in	**the** /ðə/
20	/ʃ/	as in	**she** /ʃi:/
21	/ʒ/	as in	**television** /'telɪvɪʒn/
22	/tʃ/	as in	**child** /tʃaɪld/
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30	/ɑ:/	as in	**father** /'fɑ:ðə/
31	/ɒ/	as in	**hot** /hɒt/
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33	/ʊ/	as in	**football** /'fʊtbɔ:l/
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40	/aɪ/	as in	**my** /maɪ/
41	/aʊ/	as in	**how** /haʊ/
42	/ɔɪ/	as in	**boy** /bɔɪ/
43	/ɪə/	as in	**hear** /hɪə/
44	/eə/	as in	**where** /weə/
45	/ʊə/	as in	**tour** /tʊə/

1 Agriculture: A brief history

Term practice

agronomy
aquifer
biofuel
breeding
cereals
civilization
climate
cultivation
dairy
damage
debate
degradation
drainage
farming
fertilizer
fungi (plural of fungus)
global warming
industrialized
large-scale
livestock
machinery
Modern
monoculture
nursery plants
ornamental
pesticide
poultry
productivity
rainforest
raw material
resource
species
yield

Agriculture is the cultivation and breeding of animals, plants and fungi for food, fiber, biofuel, medicinal plants and other products used to sustain and enhance life. Agriculture was the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that nurtured the development of civilization. The study of agriculture is known as agricultural science. The history of agriculture by humans dates back thousands of years, and its development has been driven and defined by greatly different climates, cultures, and technologies; industrial agriculture based on large-scale monoculture farming has become the dominant agricultural method. Although generally understood to denote the practices of humans, other animals—for example, fungus-growing ants—have also been found to engage in agriculture.

Modern agronomy, plant breeding, agrochemicals such as pesticides and fertilizers, and technological developments have in many cases sharply increased yields from cultivation, but at the same time have caused widespread ecological damage and negative human health effects. Selective breeding and modern practices in animal husbandry have similarly increased the output of meat, but have raised concerns about animal welfare, environmental damage (such as massive drainage of resources such as water and feed fed to the animals, global warming, rainforest destruction, leftover waste products that are littered), and the health effects of the antibiotics, growth hormones, artificial additives and other chemicals commonly used in industrial meat production. Genetically modified organisms are an increasing component of agriculture, although they are banned in several countries. Agricultural food production and water management are increasingly becoming global issues that are fostering debate on a number of fronts. Significant degradation of land and water resources, including the depletion of aquifers, has been observed in recent decades, and the effects of global warming on agriculture and of agriculture on global warming are still not fully understood. However, entomophagy would solve most of the former problems, and may start to gain popularity among society in the West.

The major agricultural products can be broadly grouped into foods, fibers, fuels, and raw materials. Specific foods include cereals (grains), vegetables, fruits, oils, meats and spices. Fibers include cotton, wool, hemp, silk and flax. Raw materials include lumber and bamboo. Other useful materials are also produced by plants, such as resins, dyes, drugs, perfumes, biofuels and ornamental products such as cut flowers and nursery plants. Over one third of the world's workers are employed in agriculture, second only to the service sector, although

the percentages of agricultural workers in developed countries has decreased significantly over the past several centuries.

Industrial agriculture is a modern form of farming that refers to the industrialized production of livestock, poultry, fish, and crops. The methods of industrial agriculture are technoscientific, economic, and political. They include innovation in agricultural machinery and farming methods, genetic technology, techniques for achieving economies of scale in production, the creation of new markets for consumption, the application of patent protection to genetic information, and global trade. These methods are widespread in developed nations and increasingly prevalent worldwide. Most of the meat, dairy, eggs, fruits, and vegetables available in supermarkets are produced using these methods of industrial agriculture.

While industrial agriculture strives to lower costs and increase productivity, the methods of industrial agriculture also have unintended consequences. The degree and significance of these unintended consequences is subject to debate, as is the question of the best way to deal with these consequences.

EXERCISE

A. Words in context: Try to use the following terms in *sentence* or associate them with other words to make phrases or *compound words*.

agriculture	**compound:** *sustainable agriculture, industrial agriculture* **sentence:** *Agriculture was the key development in human civilization.*
species	**compound:** **sentence:**
modern	**compound:** **sentence:**
climate	**compound:** **sentence:**
history	**compound:** **sentence:**
pesticide	**compound:** **sentence:**

B. Affixation: Practice the formation and meaning of the following words from prefix and suffix.

prefix / sufix	meaning	stem	word	meaning
-tion	فرایند، عمل	cultivate	cultivation	کشت و کار
bio-	زنده، مربوط به زندگی	fuel	biofuel	سوخت زیستی
-al		agriculture	agricultural	
anti-		toxin	antitoxin	
de-		compose	decompose	

C. Structure: Fill in the blanks with the appropriate form of the words given.

noun	verb	adjective	adverb
cultivation	cultivate	cultivated	
breed	breed		
fertilizer	fertilize	fertile	
globe	globalize	global	globally
product / produce	produce	productive	productively

1. The …… economy has grown in every year since 1944.
2. Initial testing of the nitrogenous …… was positive.
3. Some animals will not …… when kept in cages.
4. Agriculture is the …… of plants and other products used to sustain life.
5. Industrialized countries use several operations to …… much of the global supplies of poultry.

2 Green plants and photosynthesis

Term practice

absorb

algae

atmosphere

balanced

carbohydrate

carbon dioxide

carbon fixation

cell

cellular

chemical energy

chlorophyll

chloroplasts

convert

hydrogen

light-dependent

living organisms

membrane

metabolism

organelle

organic compounds

oxygen

photoautotrophs

pigment

process

product

reaction

release

respiration

source

sunlight

synthesize

transform

Photosynthesis, the process by which green plants and certain other organisms transform light energy into chemical energy. During photosynthesis in green plants, light energy is captured and used to convert water, carbon dioxide, and minerals into oxygen and energy-rich organic compounds. This chemical energy is stored in carbohydrate molecules, such as sugars, which are synthesized from carbon dioxide and water – hence the name *photosynthesis,* from the Greek *phos*, "light", and *synthesis*, "putting together". In most cases, oxygen is also released as a waste product. Most plants, most algae, and cyanobacteria perform photosynthesis; such organisms are called photoautotrophs. Photosynthesis is largely responsible for producing and maintaining the oxygen content of the Earth's atmosphere, and supplies all of the organic compounds and most of the energy necessary for life on Earth.

Although photosynthesis is performed differently by different species, the process always begins when energy from light is absorbed by proteins called reaction centres that contain green chlorophyll pigments. In plants, these proteins are held inside organelles called chloroplasts, which are most abundant in leaf cells, while in bacteria they are embedded in the plasma membrane. In these light-dependent reactions, some energy is used to strip electrons from suitable substances, such as water, producing oxygen gas. The hydrogen freed by the splitting of water is used in the creation of two further compounds that serve as short-term stores of energy, enabling its transfer to drive other reactions: these compounds are reduced nicotinamide adenine dinucleotide phosphate (NADPH) and adenosine triphosphate (ATP), the "energy currency" of cells.

Photosynthetic organisms are photoautotrophs, which means that they are able to synthesize food directly from carbon dioxide and water using energy from light. However, not all organisms that use light as a source of energy carry out photosynthesis; photoheterotrophs use organic compounds, rather than carbon dioxide, as a source of carbon. In plants, algae, and cyanobacteria, photosynthesis releases oxygen. This is called *oxygenic photosynthesis* and is by far the most common type of photosynthesis used by living organisms. Although there are some differences between oxygenic photosynthesis in plants, algae, and cyanobacteria, the overall process is quite similar in these organisms. There are also many varieties of anoxygenic photosynthesis, used mostly by certain types of bacteria, which consume carbon dioxide but do not release oxygen.

Carbon dioxide is converted into sugars in a process called carbon fixation; photosynthesis captures energy from sunlight to convert carbon dioxide into carbohydrate. Carbon fixation is

an endothermic redox reaction. In general outline, photosynthesis is the opposite of cellular respiration; in the latter, glucose and other compounds are oxidized to produce carbon dioxide and water, and to release chemical energy (an exothermic reaction) to drive the organism's metabolism. The two processes, reduction of carbon dioxide to carbohydrate and then later oxidation of the carbohydrate, are distinct: photosynthesis and cellular respiration take place through a different sequence of chemical reactions and in different cellular compartments. Photosynthesis can be represented using a overall balanced equation as follows:

$6CO2 + 6H2O + \text{Sunlight energy} \rightarrow C6H12O6 + 6O2$

(carbon dioxide + water + light energy → carbohydrate + oxygen)

EXERCISE

A. Words in context: Try to use the following terms in *sentence* or associate them with other words to make phrases or *compound words*.

organic	**compound:** *organic matter, organic farming* **sentence:** *Photosynthesis supplies the organic compounds for life on Earth.*
absorb	**compound:** **sentence:**
process	**compound:** **sentence:**
convert	**compound:** **sentence:**
source	**compound:** **sentence:**
transform	**compound:** **sentence:**

B. Affixation: Practice the formation and meaning of the following words from prefix and suffix.

prefix / sufix	meaning	stem	word	meaning
-ic	وابسته یا مربوط به	organ	organic	آلی، مربوط به ماده آلی
-ize		synthesis	synthesize	
-en-		able	enable	
tri-			triphosphate	
di-				

C. Structure: Fill in the blanks with the appropriate form of the words given.

noun	verb	adjective	adverb
synthesis	synthesize	synthetic	synthetically
transformation	transform	transformative	
difference	differ	different	differently
chemistry / chemical		chemical	chemically
reduction	reduce	reductive	reducibly

1. You can train greenhouse cucumber plant in …… ways.
2. It is necessary to …… pesticide use to approach healthy crop products.
3. …… leather is produced by the process of chemical synthesis.
4. A …… substance is a form of matter that has constant chemical composition.
5. Frederick Griffith British bacteriologist demonstrated …… in bacteria in 1928.

3 Soil, water, and plant

Term practice

aeration

aerenchyma

capillarity

clay

concentration

density

evapo transpiration

gravity

heterogeneous

irrigation

liquid

moisture

nutrient

organic matter

osmotic pressure

pore

pore space

root zone

saturate

solid

solvent

surface tension

turgidity

uptake

void space

wilting point

Both **soil** and **water** are essential for **plant** growth. The soil provides a structural base to the plants and allows the root system (the foundation of the plant) to spread and get a strong hold. The pores of the soil within the root zone hold moisture which clings to the soil particles by surface tension in the driest state or may fill up the pores partially or fully saturating with it useful nutrients dissolved in water, essential for the growth of the plants. The roots of most plants also require oxygen for respiration. Hence, full saturation of the soil pores leads to restricted root growth for these plants. (There are exceptions, though, like the rice plant, in which the supply of oxygen to the roots is made from the leaves through aerenchyma cells which are continuous from the leaves to the roots).

Soil is a heterogeneous mass consisting of a three phase system of solid, liquid and gas. Mineral matter, consisting of sand, silt and clay and organic matter form the largest fraction of soil and serves as a framework (matrix) with numerous pores of various proportions. The void space within the solid particles is called the soil pore space. Decayed organic matter derived from the plant and animal remains are dispersed within the pore space. The soil air is totally expelled from soil when water is present in excess amount than can be stored.

On the other extreme, when the total soil is dry as in a hot region without any supply of water either naturally by rain or artificially by irrigation, the water molecules surround the soil particles as a thin film. In such a case, pressure lower than atmospheric thus results due to surface tension capillarity and it is not possible to drain out the water by gravity. The salts present in soil water further add to these forces by way of osmotic pressure. The roots of the plants in such a soil state need to exert at least an equal amount of force for extracting water from the soil mass for their growth.

Water is absorbed mostly through the roots of plants, though an insignificant absorption is also done through the leaves. Plants normally have a higher concentration of roots close to the soil surface and the density decreases with depth. In a normal soil with good aeration, a greater portion of the roots of most plants remain within 0.45m to 0.60m of surface soil layers and most of the water needs of plants are met from this zone. As the available water from this zone decreases, plants extract more water from lower depths. When the water content of the upper soil layers reach wilting point, all the water needs of plants are met from lower layers. Since there exists few roots in lower layers, the water

extract from lower layers may not be adequate to prevent wilting, although sufficient water may be available there.

Importance of water in plant growth

During the life cycle of a plant water, among other essential elements like air and fertilizers, plays a vital role, some of the important ones being:

- Water maintains the turgidity of the plant cells, thus keeping the plant erect. Water accounts for the largest part of the body weight of an actively growing plant and it constitutes 85 to 90 percent of the body weight of young plants and 20 to 50 percent of older or mature plants.
- Water provides both oxygen and hydrogen required for carbohydrate synthesis during the photosynthesis process.
- Water acts as a solvent of plant nutrients and helps in the uptake of nutrients from soil.
- Food manufactured in the green parts of a plant gets distributed throughout the plant body as a solution in water.
- Transpiration is a vital process in plants and does so at a maximum rate (called the potential evapo transpiration rate) when water is available in adequate amount. If soil moisture is not sufficient, then the transpiration rate is curtailed, seriously affecting plant growth and yield.
- Leaves get heated up with solar radiation and plants help to dissipate the heat by transpiration, which itself uses plant water.

EXERCISE

A. Words in context: Try to use the following terms in *sentence* or associate them with other words to make phrases or *compound words*.

pore	**compound:** *pore space, leaf pore* **sentence***: Saturation of the soil pores leads to restricted root growth.*
clay	**compound:** **sentence:**
solid	**compound:** **sentence:**
gravity	**compound:** **sentence:**
moisture	**compound:** **sentence:**
uptake	**compound:** **sentence:**

B. Affixation: Practice the formation and meaning of the following words from prefix and suffix.

prefix / sufix	meaning	stem	word	meaning
-ar				
flor-				
ge(o)-				
inter-				
-logy				

C. Structure: Fill in the blanks with the appropriate form of the words given.

noun	verb	adjective	adverb
growth	grow	growable	
essential		essential	essentially
absorption	absorb	absorbable	
solution	solve	solvent	solvently
importance		important	importantly

1. A mineral is required as an …… nutrient by organisms to perform life functions.
2. Carbonic acid is formed when water …… carbon dioxide.
3. The branches of the trees …… together to form a natural arch.
4. Saving the rainforest and halting deforestation is the most …… task for forestry.
5. The nutrient …… is the primary nutrition plants receive in hydroponics.

4 Greenhouse technology and hydroponics

Term practice

active system

agroclimatic

aquatic

cocopeat

constant

draining

drip system

environment

excess

hydroculture

immerse

infrastructure

medium

nutrient solution

passive system

perlite

potential

pump

recovery system

reservoir

soil less

timer

translucent

transparent

Greenhouse technology implies production of plants for economic use in a covered structure that allows rapid harvesting of solar radiation and modification of agroclimatic conditions conducive for plant growth and development. The technology embraces infrastructure modeling, selection of plants for adaptation, production economics, agronomic management and commercial potential, etc. "A greenhouse is a framed or an inflated structure covered with a transparent or translucent material which permits at least partial control of plant environment and which are large enough to permit a person to carry out cultural perations".

Hydroponics is a subset of hydroculture, which is the growing of plants in a soil less medium, or an aquatic based environment. Hydroponic growing uses mineral nutrient solutions to feed the plants in water, without soil.

Types of hydroponic systems:

Wick System

The wick system is described as a passive system, by which we mean there are no moving parts. From the bottom reservoir, your specific growth technology nutrient solution is drawn up through a number of wicks into the growing medium. This system can use a variety of mediums, perlite, soil or cocopeat.

Water Culture

This system is an active system with moving parts. As active hydroponic systems go, water culture is the simplest. The roots of the plant are totally immersed in the water which contains the specific growth technology nutrient solutions. An air pump with help oxygenate the water and allow the roots to breathe.

Ebb and Flow System (Flood and Drain)

This hydroponic system works by temporarily flooding the grow tray. The nutrient solution from a reservoir surrounds the roots before draining back. This action is usually automated with a water pump on a timer.

Drip System (recovery or non-recovery)

Dip systems are a widely used hydroponic method. A timer will control a water pump, which pumps water and the growth Technology nutrient solutions through a network of elevated water jets. A recovery system will collect excess nutrient solution back into the reservoir. A non-recovery drip system will avoid this allowing the pH of the reservoir not to vary. If using a recovery system, be sure to check the pH level of the reservoir regularly and adjust using either pH up or pH down solutions on a more frequent basis.

N.F.T System

The N.F.T system is at the forefront of people's minds when hydroponics is mentioned. Nutrient Film Technique uses a constant flow of your Growth Technology nutrient solution (therefore no timer is required). The solution is pumped from a reservoir into the growing tray. The growing tray requires no growing medium. The roots draw up the nutrients from the flowing solution. The downward flow pours back into the reservoir to be recycled again. Pump and electric maintenance is essential to avoid system failures, where roots can dry out rapidly when the flow stops.

Aeroponic System

Aeroponic systems are seen to be a high tech method of hydroponic growing. Like the N.F.T system the growing medium is primarily air. The roots hang in the air and are misted with nutrient solution. The misting of roots is usually done every few minutes. The roots will dry out rapidly if the misting cycles are interrupted.

EXERCISE

A. Words in context: Try to use the following terms in *sentence* or associate them with other words to make phrases or *compound words*.

medium	**compound:** *growing medium, medium height* **sentence:** *Hydroculture is the growing of plants in a soil less medium.*
drip	**compound:** **sentence:**
pump	**compound:** **sentence:**
soil	**compound:** **sentence:**
potential	**compound:** **sentence:**
passive	**compound:** **sentence:**

B. Affixation: Practice the formation and meaning of the following words from prefix and suffix.

Prefix / sufix	meaning	stem	word	meaning
-less				
myco-				
off-				
-phile				
-phyt				

C. Structure: Fill in the blanks with the appropriate form of the words given.

noun	verb	adjective	adverb
cover	cover	covered	
act / action	act	active	actively
nutrition		nutritional	
prime	prime	primary / primitive	primarily
drought	dry	dry	

1. Coarse grasses are used where …… sports are played.
2. Variation of different mixes in the plant life cycle optimizes its …… value.
3. A high-quality greenhouse …… can help protect the plants from sun and wind.
4. A …… is a period of below-average precipitation in a given region.
5. In aeroponic systems the growing medium is …… air.

5 Medicinal plants

Term practice

ailments

ancient

aromatic plants

bark

decoction

drugs

extraction

fibrous

healing

herbalism

local

pharmaceutical

phylogenetic

powdering

remedies

shrubs

stigma

supplements

synthetic

tablets

tincture

traditional

treatments

woody

The term “**medicinal plant**” includes various types of plants used in herbalism ("herbology" or "herbal medicine"). It is the use of plants for medicinal purposes, and the study of such uses.

The word “**herb**” has been derived from the Latin word, *“herba”* and an old French word *“herbe”.* Nowadays, herb refers to any part of the plant like fruit, seed, stem, bark, flower, leaf, stigma or a root, as well as a non-woody plant. Earlier, the term “herb” was only applied to non-woody plants, including those that come from trees and shrubs. These medicinal plants are also used as food, flavonoid, medicine or perfume and also in certain spiritual activities.

Plants have been used for medicinal purposes long before prehistoric period. Ancient Unani manuscripts Egyptian papyrus and Chinese writings described the use of herbs. Evidence exist that Unani Hakims, Indian Vaids and European and Mediterranean cultures were using herbs for over 4000 years as medicine. Indigenous cultures such as Rome, Egypt, Iran, Africa and America used herbs in their healing rituals, while other developed traditional medical systems such as Unani, Ayurveda and Chinese Medicine in which herbal therapies were used systematically.

Traditional systems of medicine continue to be widely practised on many accounts. Population rise, inadequate supply of drugs, prohibitive cost of treatments, side effects of several synthetic drugs and development of resistance to currently used drugs for infectious diseases have led to increased emphasis on the use of plant materials as a source of medicines for a wide variety of human ailments.

Among ancient civilisations, India has been known to be rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products. About 8,000 herbal remedies have been codified in AYUSH systems in INDIA. Ayurveda, Unani, Siddha and Folk (tribal) medicines are the major systems of indigenous medicines. Among these systems, Ayurveda and Unani Medicine are most developed and widely practised in India.

Recently, WHO (World Health Organization) estimated that 80 percent of people worldwide rely on herbal medicines for some aspect of their primary health care needs. According to WHO, around 21,000 plant species have the potential for being used as medicinal plants.

Medicinal plants are often tough and fibrous, requiring some form of preparation to make them convenient to administer. According to the Institute for Traditional Medicine, common methods for the preparation of herbal medicines include decoction, powdering, and extraction with alcohol, in each case yielding a mixture of substances. Decoction involves crushing and then boiling the plant material in water to produce a liquid extract. Powdering involves drying the plant material and then crushing it to yield a powder that can be compressed into tablets. Alcohol extraction involves soaking the plant material in cold alcohol to form a tincture.

Plant medicines are in wide use around the world. In most of the developing world, especially in rural areas, local traditional medicine, including herbalism, is the only source of health care for people, while in the developed world, alternative medicine including use of dietary supplements is marketed aggressively using the claims of traditional medicine. As of 2015, most products made from medicinal plants had not been tested for their safety and efficacy, and products that were marketed in developed economies and provided in the undeveloped world by traditional healers were of uneven quality, sometimes containing dangerous contaminants.

A 2012 phylogenetic study built a family tree down to genus level using 20,000 species to compare the medicinal plants of three regions, Nepal, New Zealand and the South African Cape. It discovered that the species used traditionally to treat the same types of condition belonged to the same groups of plants in all three regions, giving a "strong phylogenetic signal". Since many plants that yield pharmaceutical drugs belong to just these groups, and the groups were independently used in three different world regions, the results were taken to mean 1) that these plant groups do have potential for medicinal efficacy, 2) that undefined pharmacological activity is associated with use in traditional medicine, and 3) that the use of a phylogenetic groups for medicines in one region may predict their use in the other regions.

EXERCISE

A. Words in context: Try to use the following terms in *sentence* or associate them with other words to make phrases or *compound words*.

ancient	**compound:** *ancient China, ancient civilizations* **sentence:** *Iranian ancient civilization is a rich repository of medicinal plants..*
bark	**compound:** **sentence:**
woody	**compound:** **sentence:**
tincture	**compound:** **sentence:**
shrub	**compound:** **sentence:**
drug	**compound:** **sentence:**

B. Affixation: Practice the formation and meaning of the following words from prefix and suffix.

Prefix / sufix	meaning	stem	word	meaning
sal-				
-scope				
semi-				
-therm				
-troph				

C. Structure: Fill in the blanks with the appropriate form of the words given.

noun	verb	adjective	adverb
application	apply	applied	
culture	culture	cultural	
civilization	civilized	civil	
system	systematize	systematic	systematically
development	develop	developed / developmental	

1. The emergence of …… is associated with the agricultural revolution in the past.
2. The …… stages in plants can be divided into vegetative and reproductive stages.
3. A number of techniques are …… in the practice of bonsai development.
4. Species of microbial food …… are identified in fermented food products.
5. In some traditional medical systems herbal therapies were used …… .

6 Agricultural biotechnology

Term practice

agricultural science

aspect

breeding

characteristics

crossing

diagnose

diagnostic

genetic engineering

genetic make-up

genetic modification

improve

laboratory

manipulate

modify

molecular markers

precise

regeneration

reproduction

room temperature

technique

tissue culture

tool

trait

transgene

Agricultural biotechnology, also known as **agritech**, is an area of agricultural science involving the use of scientific tools and techniques, including genetic engineering, molecular markers, molecular diagnostics, vaccines, and tissue culture, to modify living organisms: plants, animals, and microorganisms. Crop biotechnology is one aspect of agricultural biotechnology which has been greatly developed upon in recent times. Desired traits are exported from a particular species of Crop to an entirely different species. These transgene crops possess desirable characteristics in terms of flavor, color of flowers, growth rate, size of harvested products and resistance to diseases and pests.

Broadly speaking, biotechnology is any technique that uses living organisms or substances from these organisms to make or modify a product for a practical purpose. Biotechnology can be applied to all classes of organism – from viruses and bacteria to plants and animals – and it is becoming a major feature of modern medicine, agriculture and industry. Modern agricultural biotechnology includes a range of tools that scientists employ to understand and manipulate the genetic make-up of organisms for use in the production or processing of agricultural products.

Agricultural biotechnology is a collection of scientific techniques used to improve plants, animals and microorganisms. Based on an understanding of DNA, scientists have developed solutions to increase agricultural productivity. Starting from the ability to identify genes that may confer advantages on certain crops, and the ability to work with such characteristics very precisely, biotechnology enhances breeders' ability to make improvements in crops and livestock. Biotechnology enables improvements that are not possible with traditional crossing of related species alone.

How is agricultural biotechnology used?

Genetic engineering: Scientists have learned how to move genes from one organism to another. This has been called genetic modification (GM), genetic engineering (GE) or genetic improvement (GI). Regardless of the name, the process allows the transfer of useful characteristics (such as resistance to a disease) into a plant, animal or microorganism by inserting genes (DNA) from another organism. Virtually all crops improved with transferred DNA (often called GM crops or GMOs) to date have been developed to aid farmers to increase productivity by reducing crop damage from weeds, diseases or insects.

Molecular markers: Traditional breeding involves selection of individual plants or animals based on visible or measurable traits. By examining the DNA of an organism, scientists can use molecular markers to select plants or animals that possess a desirable gene, even in the absence of a visible trait. Thus, breeding is more precise and efficient. For example, the International Institute of Tropical Agriculture has used molecular markers to obtain cowpea resistant to bruchid (a beetle), disease-resistant white yam and cassava resistant to Cassava Mosaic Disease, among others. Another use of molecular markers is to identify undesirable genes that can be eliminated in future generations.

Molecular diagnostics: Molecular diagnostics are methods to detect genes or gene products that are very precise and specific. Molecular diagnostics are used in agriculture to more accurately diagnose crop/livestock diseases.

Vaccines: Biotechnology-derived vaccines are used in livestock and humans. They may be cheaper, better and/or safer than traditional vaccines. They are also stable at room temperature, and do not need refrigerated storage; this is an important advantage for smallholders in tropical countries. Some are new vaccines, which offer protection for the first time against some infectious illnesses. For example, in the Philippines, biotechnology has been used to develop an improved vaccine to protect cattle and water buffalo against hemorrhagic septicemia, a leading cause of death for both species.

Tissue culture: Tissue culture is the regeneration of plants in the laboratory from disease-free plant parts. This technique allows for the reproduction of disease-free planting material for crops. Examples of crops produced using tissue culture include citrus, pineapples, avocados, mangoes, bananas, coffee and papaya.

EXERCISE

A. Words in context: Try to use the following terms in *sentence* or associate them with other words to make phrases or *compound words*.

science	**compound:** *applied science, science journal* **sentence***: Agricultural biotechnology is an area of agricultural science.*
aspect	**compound:** **sentence:**
precise	**compound:** **sentence:**
tool	**compound:** **sentence:**
laboratory	**compound:** **sentence:**
crossing	**compound:** **sentence:**

B. Affixation: Practice the formation and meaning of the following words from prefix and suffix.

Prefix / sufix	meaning	stem	word	meaning
vermin-				
re-				
xer(o)-				
-zygo-				
tetr(a)-				

C. Structure: Fill in the blanks with the appropriate form of the words given.

noun	verb	adjective	adverb
science		scientific	scientifically
gene		genetic	genetically
diagnosis	diagnose	diagnostic	
harvest	harvest		
life	live	living	

1. A plant …… laboratory is required for the identification of specific pathogens.
2. Landscape engineering is the interdisciplinary application of …… innovations.
3. Many gardeners …… their own cut flowers from domestic gardens.
4. There are many industrial applications for …… modified organisms.
Agricultural biotechnology may be defined as the use of …… plant organisms.

Chapter 1

Market Wire, "Global Agricultural Issues Take Center Stage at World Agricultural Forum's 2003 World Congress" *FindArticles.com.* (2003).

Safety and health in agriculture. International Labour Organization. 1999. pp. 77–. ISBN 978-92-2-111517-5.

Chapter 2

Bryant DA, Frigaard NU (Nov 2006). "Prokaryotic photosynthesis and phototrophy illuminated". Trends in Microbiology. ***14*** *(11): 488–96. doi:10.1016/j.tim.2006.09.001. PMID 16997562.*

ENCYCLOPEDIA BRITANNICA

Whitmarsh J, Govindjee (1999). "Chapter 2: The Basic Photosynthetic Process". In Singhal GS, Renger G, Sopory SK, Irrgang KD, Govindjee. Concepts in Photobiology: Photosynthesis and Photomorphogenesis. Boston: Kluwer Academic Publishers. p. 13. ISBN 978-0-7923-5519-9.

Chapter 3

Majumdar, D K (2000) *Irrigation Water Management* by, Prentice Hall of India.

Chapter 4

Chandra P, Panwar J (1987) Greenhouse technology and its scope in India. In: Proceedings of the national symposium

Hanan JJ, Honey WD, Goldsberry KL (1978) Greenhose management. Springer, New York.

https://www.maximumyield.com

on use of plastics in agriculture, New Delhi, pp 62–66.

Santos, J. D. et al (2013) Development of a vinasse nutritive solutions for hydroponics. Journal of Environmental Management 114: 8-12.

Chapter 5

https://www.nhp.gov.in

"Traditional Medicine. Fact Sheet No. 134". World Health Organization. May 2003. Archived from the original on 28 July 2008. Retrieved 26 February 2017.

Saslis-Lagoudakis, C. H.; Savolainen, V.; Williamson, E. M.; Forest, F.; Wagstaff, S. J.; Baral, S. R.; Watson, M. F.; Pendry, C. A.; Hawkins, J. A. (2012). "Phylogenies reveal predictive power of traditional medicine in bioprospecting". Proceedings of the National Academy of Sciences. ***109*** *(39): 15835–15840. Bibcode:2012PNAS..10915835S. doi:10.1073/pnas.1202242109. ISSN 0027-8424.*

Dharmananda, Subhuti (May 1997). "The Methods of Preparation of Herb Formulas: Decoctions, Dried Decoctions, Powders, Pills, Tablets, and Tinctures". Institute of Traditional Medicine, Portland, Oregon.

Chapter 6

"What is Agricultural Biotechnology?" (PDF). Cornell University. Retrieved 3 February 2015.

Agricultural biotechnology: What are the issues? The Land Grant University Brochure, Cornell University, College of Agriculture and Life Sciences (http://www.nysaes.cornell.edu/comm/gmo/PDF/GMOLandGrant.pdf)

Genetically Engineered Organisms - Public Issues Education Project, Cornell University (http://www.geo-pie.cornell.edu/)

Ives, C. L., Johanson, A., Lewis. J. (2001). Agricultural Biotechnology: A Review of Contemporary Issues. USAID.

James, C. 2003. Preview: Global Status of Commercialized Transgenic Crops: 2003. ISAAA Briefs No. 30. Ithaca, NY

منابع برای مطالعه بیشتر

فخری، ا. ۱۳۹۴. *فرهنگ اختصارات علوم کشاورزی*. اکبر فخری.

فخری، ا.، مسأله دان، و ارجمند، م. ۱۳۹۲. *فرهنگ باغ و منظر*. انتشارات پریور.

فخری، ا. ۱۳۸۳. *گزارش طرح تحقیقاتی: مقایسه راندمان آبیاری وکیفیت محصولات تولیدی گلخانه ای تحت شرایط آبیاری قطره ای وزیرزمینی سفالی*. سازمان مدیریت وبرنامه ریزی آذربایجان شرقی.

فخری، ا.، مسأله دان، س.، اسکندری، س. و ارجمند، م. ۱۳۹۰. *واژگان و اصطلاحات تخصصی تکنولوژی گلخانه ای*. انتشارات پریور.

مصلحی، م. ۱۳۷۵. *واژگان کشاورزی*. مرکزنشردانشگاهی تهران.

هاشمی، م. ۱۳۷۵. فرهنگ جامع کشاورزی ومنابع طبیعی. انتشارات فرهنگ جامع.

www.Dictionary.com, www.google.com, www.wikipedia.org

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