



كلية العلوم

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يمكنكم طلب المحاضرات برسالة نصية (SMS) أو عبر (What's app-Telegram) على الرقم 0931497960

Plant Responses to the Environment -Tropisms and Defenses

Tropisms

1. Phototropism

In order to photosynthesize, it's important that plants grow away from shaded areas .

When light receptors in a plant's cells sense light in a certain direction , they trigger the hormone auxin to elongate the cells on the dark side of the plant such that it bends towards the light.

You may have noticed sunflowers and some other plants demonstrating a special kind of phototropism called heliotropism where the flower head, or some other part of the plant pivots to remain facing the sun as it moves across the sky every day .

2. Gravitropism, Geotropism

When we first discussed auxin, we mentioned gravitropism, also known as geotropism, which is plant growth related to gravity. This is important when plants are first emerging from their seeds .

Positive gravitropism helps the roots grow downward towards the pull of gravity ,while negative gravitropism helps the stem grow upward against the pull of gravity .

3. Hydrotropism

Hydrotropism is growth in relation to concentrations of water.

Positive hydrotropism causes plant roots to grow towards saturated soil in order to collect water for the plant .

But there is also such a thing as having too much water.

Plant roots can actually drown in oversaturated soil, so negative hydrotropism causes roots to grow into drier soils .

4. Thigmotropism

When parts of a plant encounter a solid object, they demonstrate thigmotropism or growth in response to physical touch. Positive thigmotropism can be seen when a climbing vine wraps itself around a solid object as it grows.

Negative thigmotropism is exhibited by roots growing away from or around rocks in the soil. We are probably getting the basic idea of how tropisms work.

5. Chemotropism

Chemotropism is growth in relation to concentrations of certain chemicals .

6. Thermotropism

Thermotropism is growth in response to temperature.

Each of these tropisms we mentioned is important in maximizing the survival and therefore reproductive success of a plant .

Let's now return to the idea of phototropism for a moment.

Plants are able to sense the presence and direction of light, but also the amount of light, the angle of the light and the amount of time each day that light is present.

All of this is very important for helping to determine the circadian rhythms and phenology of the plant, which are words that refer to responses towards the day-night cycle on Earth, as well as other cyclic or seasonal phenomena .

Plant circadian rhythms determine when buds open into flowers, when flowers close for the night and other day-night cycles of plant behavior.

These rhythms are achieved primarily using the light sensors in plant cells, as well as the cycles of hormone concentrations within a plant .

While circadian rhythms are the day-night cycles of plants, phenology is how scientists describe the seasonal or yearly cycles of plants.

Most plants do their growing during the warm wet months of the year, and then either become dormant or die during the dry cool months.

But plant phenology can get much more complicated than that .

The first wildflowers of the year begin to grow and bloom when the angle of the sun rises above a certain point, signaling that spring is on its way.

Similarly, trees lose their leaves in autumn when they sense shortening photoperiods, or the amount of time with sunlight each day.

Changes like leafing out and flowers blooming are important for a plant's life cycle but also for the other living things that might rely on that plant for food or other resources .

Defenses

plant Physical defenses

However, plants have been participating in the evolutionary arms race against herbivory for a long time, and they have evolved some clever ways to protect themselves Physical plant defenses are things that would physically deter an herbivore from eating a plant.

Some examples of physical plant defenses are spines or thorns like on honey locust trees or cacti.

Plants can also have a tough outer coating such as bark or a waxy substance that prevents herbivores from being able to bite through a plant's tissues .

When plants are working to deter insect herbivores, they can enact much smaller physical defenses, too.

Many leaves have tiny hairs on them that feel soft to our hands but work like giant thorns against insect bodies.

Some plants also have high silica content in their leaves.

Chewing on leaves full of silica grinds down the mouthparts of insects and prevents them from eating effectively, or may even cause them to starve to death .

Plant chemical defenses

Plant chemical defenses can range from chemicals that make a plant smell or taste bad to an herbivore, all the way up to extremely deadly poisons .

There are also plants with topical chemical defenses like poison ivy and wild parsnip.

If an animal gets the oils from these plants on their exposed skin, it can wind up with an itchy rash or even chemical burns.

And again, plants have a special set of chemical defenses for dealing with insects.

On top of taste deterrents and toxins, some plants also produce chemical compounds that mimic insect growth hormones.

If an insect consumes too much of these hormone mimics it can be prevented from changing to its next life stage or reproducing .

And with that, we've learned a bit about the behavior of plants including the ways they interact with physical stimuli, and other living organisms.

Combining this with previous information on plant structure, plant growth, and plant classification, that leaves us with a reasonable understanding of the incredible world of plants.

Wishing you the best of luck

Engr. Maissoun Ziadeh

Vocabulary - Lecture 9

مفردات المحاضرة التاسعة

Responses	استجابات	Participating	تشارك
Environment	بيئة	Herbivory	العاشبات
Tropisms	التوجّهات	Spines	أشواك
Defenses	الدفاعات	Thorns	أشواك
Phototropism	توجّه ضوئي	Honey locust	شجرة الغلاديشيا
Shaded areas	مناطق مظلمة	Enact	تحدث
Receptors	مستقبلات	Chewing	مضغ
Sense light	تتحمس الضوء	Grinds down	يسحق
Heliotropism	التوجّه للشمس	Starve	يجوع
Pivots	يدور على محور	Poisons	سموم
Gravitropism	التوجه المرتبط بالجاذبية	Topical	موضعي
Pull of gravity	شدّ الجاذبية	Ivy	اللبالب السام
Hydrotropism	التوجه المرتبط بالماء	Parsnip	الجزر الأبيض
Saturated	مشبعة	Exposed	مكتشف
Drown in	تغرق في	wind up	ينتهي الأمر
Thigmotropism	التوجه المرتبط بالأشياء	Itchy rash	طفح جلدي مثير للحكة
Encounter	يواجه	chemical burns	حروق كيميائية
Solid object	جسم صلب	Taste deterrents	موانع تذوق
Vine wraps	تلتف النباتات المتعرشة	Toxins	السموم
Exhibited	يظهر	Mimic	تقلّد – تحاكي
Chemotropism	التوجه المرتبط بالمواد الكيميائية	Consumes	استهلكت
Thermotropism	التوجه المرتبط بالحرارة	Life stage	مرحلة حياة
Angle	زاوية	Behavior	سلوك
Circadian Rhythms	إيقاعات الساعة البيولوجية	Physical stimuli	المنبهات الجسدية
Phenology	مراحل النمو	Combining	بدمج – بجمع
phenomena	الظواهر	Reasonable	مقبول