PENANG SANGAM HIGH SCHOOL
P.O.BOX 44, RAKIRAKI
LESSON NOTES
WEEK 20

Year/Level: 13A/B **Subject:** BIOLOGY

Strand	2 Living Together
Sub Strand	2.1 Organisms And The Environment
Content Learning Outcome	• Define photoperiodism and explain the varying effects on flowering • Explain tolerance and its role in creating distinct zones

Photoperiodism

Many plants exhibit photoperiodism the respond to change in day length by making appropriate physiological changes such as the flowering and dropping of the leaves.

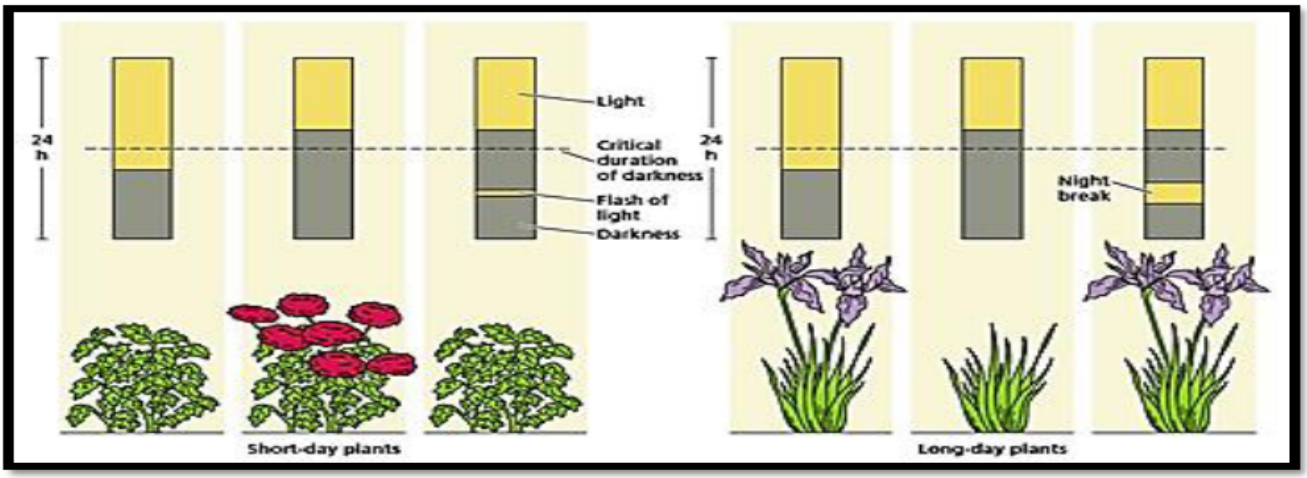
1.Short day plants

These require a short day and a long night; they will only produce flowers if photoperiod is less than a certain critical length.

For example, a short day species with a 10 hour critical photoperiod will flower only if the dark period ex ceeds 14 hours (24hours–10 hours = 14 hours).These flower in winter, early spring and autumn for example: chrysanthemums, cosmos, and poinsettias.

2. Long day plants

These require a long day and short night, or more correctly they require a photoperiod that exceeds a certain critical length for flowering to take place. This plant flowers in summer for example: lettuce and petunias



3. Day Neutral

The flowering of these plants are not affected by the amount of day light per day for example: tomatoes.

Leaves Detect the Flowering Stimulus

By exposing different parts of both short day plant and long day plant to different photoperiods, it was found that photoperiod is detected by the leaves while the site of future flowering production being in se nsitive. Hence it was concluded that some kind of signal travelled from leaves to the stem.

Photoperiodic Induction Involves Phytochrome

A brief period of light during the night can reverse the photoperiodic responses suggested an obvious experiment. When the wavelengths (but equal energies) of light were used to interrupt the night, red light was found to be most effective in preventing flowering in short-day plants and inducing flowering in lon g-day plants. A graph of effectiveness of light on flowering plotted against its wavelength is called an action spectrum.

Post-germination changes in growth

Vernalisation (common in plants)

Other environment factors besides day-length can influence flowering. Many plants native to temperate climates will not flower until they have been subjected to a prolong period (several weeks) of cold. Prom otion of flowering by chilling is called vernalisation.

Diapause (common in insects)

Diapause is a period of arrested development, common in insects and other arthropods native to climate with a cold season. Only after a period of exposure to cold conditions is development resumed. For example, black field cricket, eggs require several weeks of chilling before they hatch.

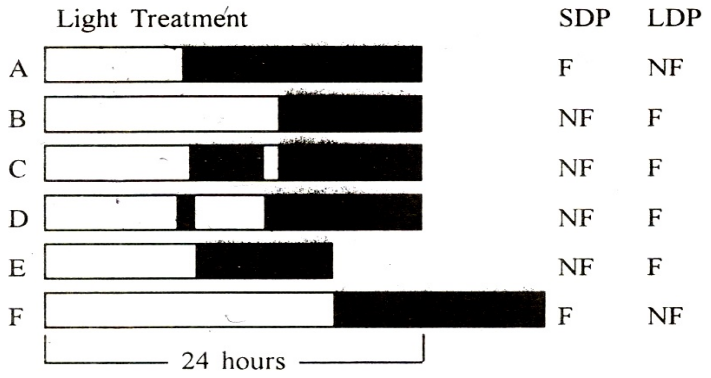


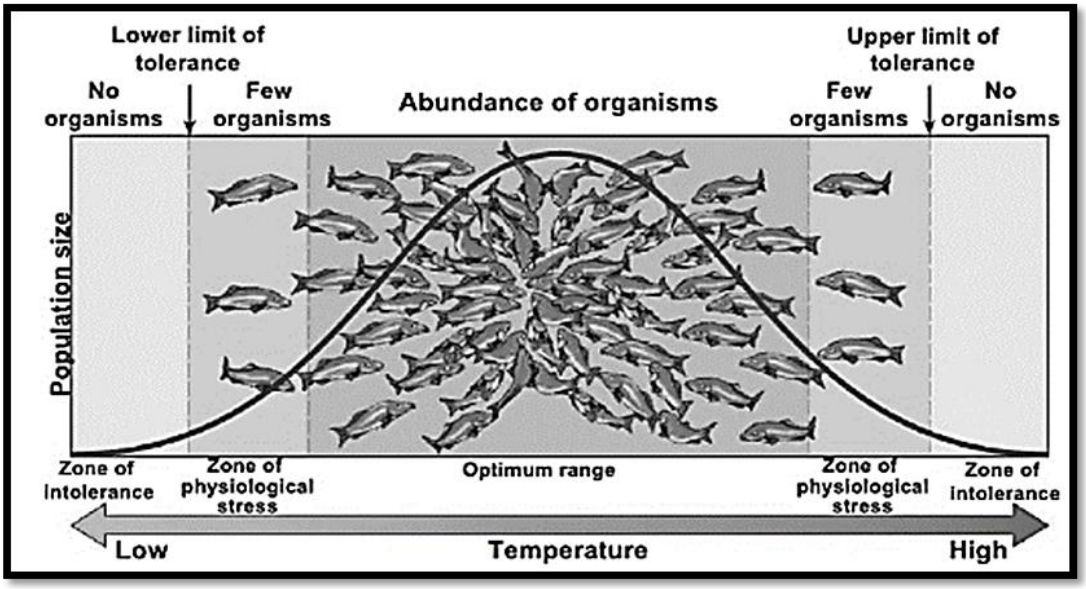
FIGURE: *The effect of various light treatments on a short-day plant (SDP) and a long-day plant LDP. A dark bar represents darkness, and a white bar represents light; F and NF indicate flowering and no flowering respectively.*

However the crucial factor is night length or darkness.
A – Short day plant
B – Long day plant
C – If a long night is interrupted by a few minutes of light, the short day plant does not flower (even though the day remains short)
D – interrupting the day with darkness produces no change to either the plant
E – duration of night is decreased, short day plant will not flower
F – despite the day remaining long, a short day plant will flower if the duration of darkness is increased. In contrast despite the day remaining long, a long day plant will not flower if the duration of darkness is increased.

TOLERANCE

Law of Tolerance: states that for each abiotic factor (temperature, light and soil type), an organism has a range of tolerance within which it can survive. This range is known as the species **tolerance range.**

Near the upper and the lower limits of the tolerance range, individuals experience stress which reduces their health, rate of growth and reproduction.
Within a species, **tolerance range** is an optimal range in which the species is best adapted.
Some species will have high tolerance range while others may have low tolerance range



Factors influencing plant and animal tolerance in Fiji

Abiotic factors determines the location of species habitat while biotic factors determine species success in its habitat. Temperature is the most common abiotic factor to determine survival rate of an organism.

Abiotic factors determines the location of different crops and livestock

Crop or	Main location	Physical influences	Other influences
Sugarcane	Western and northern lowlands of Viti Levu and Vanua	-Marked dry season. -High rainfall in planting and e arly growing season.	-Closeness to mills -Land leases. -Fertilizer
Coconut	Coastal areas of Vanua Levu, Taveuni, Lau and Lomaiiviti	-High rainfall that is well distrib uted. -Well drained soils & a wider ra nge of soil pH	-Large farms. -Prices
Rice	Low land areas of Vanua Levu a nd Viti Levu	-Flat low land areas. -High rainfall -SoilpHrange:approx.5.0 to 6.5	-Imports -High costs
Vegetables	River valleys and delta areas.	-River delta areas -SoilpHrange:approx.6.0 to 7.0	-Pests and diseases -Flooding and drought

Dairy farming or dairy pastures	South-eastern Viti Levu	-High rainfall -Flat to gently sloping land. -SoilpHrange:approx.6.0 to 6.5	-Close to milk Processing centre.
Beef farming	North- western parts of Main lands.	-Large grassland areas.	-Cattle on copra estates.

Activity:

1. Explain what would happen to the Short Day Plant if the dark period is interrupted by red light?

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