Delphinium, commonly known as larkspur, is naturally distributed throughout the Northern Hemisphere, including North America, Europe, and China. Worldwide, there are nearly 300 species, which include 61 recognized species in North America. Most native species of larkspur have blue or purple flowers, sometimes ranging into nearly white or yellow. A notable exception is *Delphinium nudicaule*, red larkspur, with natural distribution restricted to northern California. Red larkspur has a mutation that results in brilliant red-pigmented flowers.

To successfully reproduce, all *Delphinium* species require pollinators to move pollen from flower to flower. Bees see and are attracted to flowers ranging from ultraviolet and blue to yellow, but cannot see red. Therefore, bees are the traditional pollinators of larkspur. Fortunately for the mutant larkspur population with red pigments, hummingbirds see red quite well, and red larkspur flowers are pollinated by birds, which do not visit blue larkspurs in their daily nectar gathering activities.

Delphinium species contain neurotoxins that have been used variously as medicines and poisons throughout human history. Native Americans used extracts of *Delphinium* as an antiparasitic (killed internal and external parasites). Chinese herbalists have used it to treat neurological problems. Grazing livestock, particularly cattle, eat larkspur and become quite sick or die. The primary neurotoxin found in *Delphinium* species is lycoctonine, which inhibits acetylcholine reception (blocks receptors) at postsynaptic sites in neuromuscular junctions. Its action is much like that of curare, and was used as a surgical or laboratory substitute for curare around the turn of the 20th century. Veterinarians treating cattle who have eaten larkspur, will give physostigmine (an acetylcholinesterase inhibitor) as the preferred antidote.

A female yucca moth visits a yucca flower, collects pollen, and rolls it into a compact ball. The moth flies off with the pollen ball to another yucca flower, drills a hole in the flower's ovary wall, and lays its eggs inside the ovary. It then takes the pollen ball and smears pollen all over the stigma of the flower, pollinating it. When the moth eggs hatch, the offspring will feed and develop inside the swollen ovary of the flower. By pollinating the yucca, the moth ensures that the plant will provide a supply of developing seeds for its own offspring (caterpillars). Because the caterpillars eat only a small portion of the seeds, the yucca also reproduces successfully. Neither organism can reproduce without the other.

Plants were grown in a green house under 14 cycles of 12 hours light (day) and 12 hours dark (night). At the end of the 14th cycle, plants were divided into 4 groups that were exposed to one of four experimental light conditions.

The following table shows the photosynthetic rate under each of the experimental light conditions.

Plant Group	Treatment	Photosynthesis rate (%)
A.	Dark	0
B.	Green light	14
C.	Full spectrum of low intensity light	47

D.	Full spectrum of high intensity light	100

One of the examples of adaptive radiation that is continuously studied is that of the cichlid fishes in Lake Victoria. There are hundreds of species of cichlids in this relatively young lake (300,000 years old) and they have some interesting dietary differences: some eat algae, some plants, some mollusks, some zooplankton, some other cichlid eggs, some cichlid babies, some fish scales. This diversity of similar species in a single lake is considered an example of adaptive radiation. Currently researchers are investigating the similarities and differences among the genetic make-up of the species to see if this lends support to this hypothesis.

You are being led by an experienced biologist guide through a remote tropical rainforest. Given your BIOL 1114 experience, you are not surprised when the guide tries to scare you with tales of poisonous tropical plants and animals. Frustrated at his inability to upset you, he decides to show off by handling a snake, which he tells you is deadly but generally will not bite humans unless provoked. He explains that the snake injects neurotoxic venom that paralyzes its victim in a few seconds, and death would slowly ensue unless treated with an antidote within a few minutes. As with the other toxic plants and animals he had pointed out, you inquire into the mechanism of action of the toxin. He says it affects mainly skeletal muscle (not internal organs), by holding neuron potassium gates open. You are just about to ask if there is a local antidote when the (apparently provoked!) snake bites your guide on his forearm. After an instant of stunned surprise, he manages to say “quick, find me a ...” before collapsing in silence. He remains conscious with more or less normal pulse and breathing, and can blink his eyes slowly. You hope you can correctly (and quickly!) recall what he had just been telling you about various poisonous plants and animals you had seen so far. Maybe he can confirm your choice of antidote organism by blinking his eyes.

Once you successfully revive your guide, you both decide to set up camp and study the neurotoxic vine further. Your guide says a certain species of red lizard eats the leaves of some individual vines but rarely other individual vines. Your tests reveal that the vines that are eaten do not contain the toxin, and those that are avoided are toxic. The double-toothed kite, a predatory bird species, hunts the red lizard (its main food source) mainly by using color vision.