



Seed Dispersal

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What is a seed?

A seed contains an embryo embedded in an endosperm (nutritious tissue). It contains an immature plant and everything it needs to sprout in a new location, become established, and eventually grow into an adult plant.

Without seeds, forests would not be able to regenerate. Forests are important because they provide many ecological services such as clean air and clean water, and they provide us with a lot of valuable products such as wood and food.

Why do seeds need to disperse?

All plants need water, sun, and space in order to grow. A seed cannot get the things it needs to grow if it falls immediately below its parent because its parent is already using the resources in that location. Therefore, seeds need to get to a new location in order to find the resources necessary for growth. This relocation is called dispersal.

Seeds lack the fundamental structures and innovations animals use to move from one place to another, such as legs or wings. As such, seeds evolved different strategies for dispersing to new locations.

Strategies for dispersal: Wind

Some plants have evolved seeds that use wind power to transport them from one place to another. Seeds that are dispersed by the wind have several characteristic adaptations that allow them to be successful with that strategy.

1. They are usually lighter and smaller than other seeds. This makes it easy for the wind to carry them.
2. They have special structures that catch the air, such as wings or fluff. These structures increase the seed's hang time in the air and allow them to travel extremely far distances. Winged seeds, such as those produced by maples, may

travel 180 meters or so; while some seeds, like those of a dandelion, can travel over 500 miles.

3. They are produced in large numbers. Because seeds carried by wind are taken wherever the wind blows, producing large numbers of seeds helps maximize the probability that some will reach suitable sites.

While these adaptations make it easier for a seed to be successfully wind dispersed, there are tradeoffs for this strategy.

1. Most seeds won't find a suitable place to live and will die.
2. In order to be smaller and lighter these seeds have a smaller endosperm. As such, they have fewer nutrients to live on and many will never become established.

Strategies for seed dispersal: Animal

Another strategy for seed dispersal is to use animals to carry seeds to suitable locations. There are several methods plants use to get animals to carry their seeds.

1. Making their seeds food.
 - a. Seeds can be embedded in fruits. Fruits have bright colors and nutrient rich flesh that attract animals like birds and mammals to eat them. The animals then disperse the seeds when they defecate or spit them out.
 - b. The seed itself can also become an attractive food item for an animal that likes to cache food for the winter (Ex: squirrels and acorns). Any seed the animal forgets has the opportunity to germinate into a new plant.



Seeds that attract animals by being a food source are often relatively large and heavy. Plants usually don't produce these large seeds in large numbers because each one is relatively energetically expensive to produce.

2. Seeds can also take advantage of animals by becoming hitch hikers. Seeds can develop special structures such as burs or hooks that allow them to get tangled in an animal's feathers or fur and be carried to new locations.

While seeds using this strategy can be produced in large numbers, they will never disperse unless an animal comes in contact with the plant.

Strategies for seed dispersal: Fire

Fire dispersal is fundamentally different than other types of dispersal. Fire destroys the living plant material in any area making those sites perfect for new seeds to grow. Therefore, fire dispersed seeds don't have to worry about moving to a new location; they just have to be ready to sprout right after a fire. They have many unique adaptations to allow them to do this.

1. They have the ability to be dormant for long periods of time.
2. They reside in cones sealed with a special resin (glue) that only melts to release the seeds at the temperature of a fire hot enough to kill adult trees.

Strategies for seed dispersal: Water



Plants which grow beside or in water often use water to disperse their seeds. These seeds are waterproof, and can have fluff or other structures to increase their buoyancy. In the special case of coconuts, their waterproof wooden casings allow them to be transported extremely long distances in saltwater.

Strategies for seed dispersal: Ballistic

Some seeds literally use an explosion to disperse their seeds. The seeds of these dispersers reside in pods, and as the pod dries out it will eventually burst expelling seeds in every direction. A local example of this type of dispersal is witch hazel; its seeds are held in tiny wooden capsules and can shoot several feet away when the pod bursts.

What strategy for dispersal is the best?

No strategy is the best. Each has evolved in a certain environment, and is the best strategy for those conditions!

Additional Resources:

Websites:

http://www.countrysideinfo.co.uk/seed_dispersal/index.htm

This website includes detailed descriptions of explosive, water, wind, and animal dispersal as well as an activity that can be used with students to further understanding.

<http://www.zephyrus.co.uk/firedispersal.html>

This website includes detailed descriptions of explosive, water, wind, animal, and fire dispersal.

<http://www2.bgfl.org/bgfl2/custom/resources ftp/client ftp/ks2/science/plants pt2/dispersal.htm>

This website includes animations of explosive, water, wind, and animal dispersal that can help students visualize how each type of dispersal functions.

Books:

Murray, D. R. (1986). *Seed dispersal*. Sydney: Academic Press.

Beal, W. J. (1898). *Seed dispersal*. Boston: Ginn & Co.

Dennis, A. J., Cooperative Research Centre for Tropical Rainforest Ecology and Management., & CSIRO (Australia). (2007). *Seed dispersal: Theory and its application in a changing world*. Wallingford, UK: CABI.

Pictures from the following sources (in order of appearance):

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