

## Shade cools

Nursery plants need to be protected from extreme environmental influences until they are strong enough to withstand them. Shade reduces water loss in the soil (evaporation) and water loss through the leaves (transpiration). It also reduces the temperature of the plants and of the substrate. The amount of shade needed changes during the development of the plant. A *good nursery practice* is to reduce the shade as the plants grow.

**Regulate the amount of shade and water together. When plants are in heavy shade, they require less water. When plants are in full sun, they require more water.**

### *Regulating shade*

During germination, most plants require 40–50% shade, though some species may require more or less than this. With increasing plant age, the shade should be reduced and for the last two months before the plants go to the field, they should be exposed to full sun. As described above for water, this hardening-off process helps the plants become accustomed to field conditions. Transplanting stress is minimized when plants are accustomed in the nursery to the sun's full intensity.

A *good nursery practice* is to regulate the amount of shade and water together. When plants are in heavy shade, they require less water. When plants are in full sun, they require more water. A *poor, but unfortunately common nursery practice* is to maintain plants in the shade during the entire nursery production.

Plants grown in too much shade often have the following characteristics:

- they are stunted and grow slowly, or they are tall and skinny with a soft stem which does not become woody
- their leaves are either dark green or, in very dark conditions, yellow
- they are susceptible to disease or insect attack
- they are easily sunburnt when taken to the field.

### *Types of shade*

Natural shade from trees is often preferred by nursery managers because it appears the cheapest and easiest to manage. While it provides comfortable working conditions in the nursery, frequently it provides too much shade. Shade trees should not cover the area totally; sun must also penetrate throughout the day. A *good nursery practice* is to cut the branches of natural

shade trees back (pollard) to allow light to enter. Madero negro (*Gliricidia sepium*) or poró (*Erythrina poeppigiana*), which are used as living fences, are examples of trees that pollard well because the branches grow back quickly. An ideal natural shade tree would retain its leaves in the dry season and then lose its leaves during the rainy season. This would allow protection during the hot, dry months, but would allow sunlight to penetrate during the cooler, wetter months. Unfortunately, this is usually the reverse of the normal growth cycle for most trees.

**Cut the branches of natural shade trees back (pollard) to allow light to enter.**



Natural shade trees make the nursery a cool and comfortable place to work. However, they usually provide too much shade and compete for water. Plants often grow slowly in the dark conditions.

A big disadvantage of natural shade trees near bare-root or germination beds is that their roots can compete with the seedlings for water and nutrients, especially when growing close to or in the beds. Established trees have larger and more efficient root systems and will take water and nutrients away from the seedlings which means that additional water and fertilizer need to be applied to nursery plants.

**Repair, adjust, and replace shade material in time to prevent damage to plants.**

Materials that can be used to provide shade include palm leaves, bamboo, shade cloth, and grass that can be woven into mats. Mats must allow rainwater and light to flow through evenly. If mats are not flat, rainwater can concentrate in some spots and drip excessively onto seedlings, causing considerable damage. If mats overlap, some areas may be too dark. A *good nursery practice* is to repair, adjust, and replace shade material in time to prevent damage to plants.

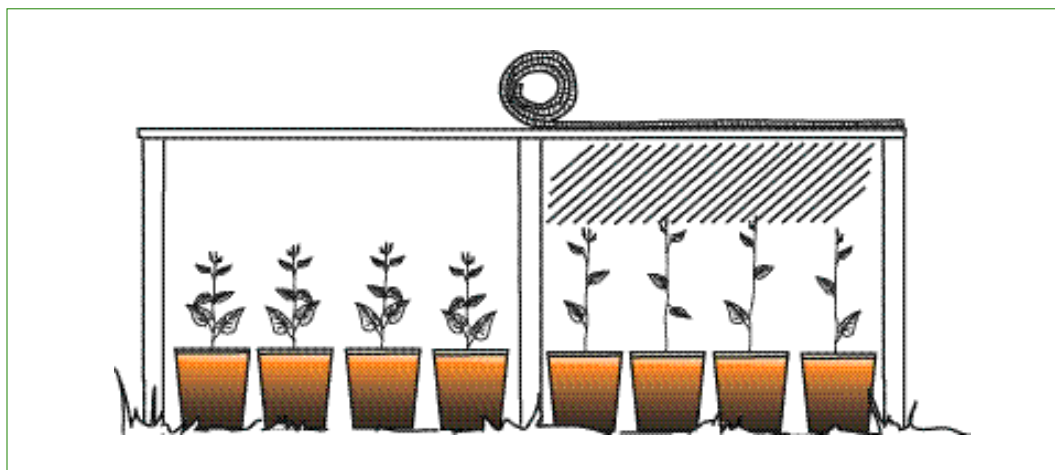
Plastic shade cloth is available in different grades that cut out from 30 to 95% of the sunlight. The most commonly used shade cloth filters out 50% of the sunlight. Experiment with different strengths for each species. While seedlings are germinating, the shade cloth can be doubled. As the plants grow, remove one layer of the shade cloth. Make sure the shade cloth has UV chemical protection in the fabric so that it does not deteriorate quickly. Enforced metal rivets, an optional but more expensive feature, are useful for fastening the cloth to a support. If stored in a dry place and kept free of dirt and rodents, shade cloth should last many years.

**Adjust the height of the shade with the sun's movement throughout the day.**

**Accustom the plants gradually to full sun.**

The height of the shade above the plants influences the shade's effectiveness. When placed 2 m above the plants, it is easier for the workers to water or weed, but it might allow too much sunlight in from the sides. A *good nursery practice*, if you can, is to adjust the height of the shade to the sun's movement throughout the day. If the bed length runs from east to west (which we recommend), then the shade can be fairly high. If the beds run north–south, the shade should be fairly low and should cover the sides of the beds so that plants on the sides of the bed are protected from full sunlight throughout the day.

Shade should be removed as the plants grow. A *good nursery practice* is to accustom the plants gradually to full sun. During the course of 10 days, remove the shade for first two, then three, then four hours in the day, and so on, until the last day you remove the shade



Artificial shade should be removed as plants grow. Too much shade, as seen on the right, may cause the plants to grow tall and spindly. Accustom the plants gradually to full sunlight.

### ***Removing the shade***

A nursery manager constructed artificial shade for the seedlings. The seedlings grew well, and had a dark green colour. But he never took the shade down, even though the plants were five months old, and almost 30 cm tall. One day, a forestry technician advised him to remove the shade. So the nursery manager removed it that same day. One week later, he returned to find that the trees were very yellow and many had dark brown, dry patches. He began to wonder if a malicious person had entered the nursery and poisoned the plants or if they were stricken with some disease. What happened? The plants were burnt because the shade was not removed gradually. The leaves were adapted to the dark conditions, and were dark in colour. When they were suddenly exposed to the sun, the chemical processes in the leaves could not adapt fast enough, and the leaves turned yellow. To demonstrate that it was not a disease or poisoning, a few plants from a shady area were put in direct sun. By observing them daily, the manager could watch them burn.

completely. Start on a rainy, overcast day, or remove the shade during the early morning or late afternoon. A *poor, but unfortunately common nursery practice* is to remove the shade at once on a hot, sunny day, burning the plants.

### ***Summary of shade***

Grow seedlings under protected conditions during their early growth. As they age, reduce the shade they get. There are different types of shade material available, such as living shade trees, bamboo mats or shade cloth. It is important that the seedlings are shaded uniformly.

#### ***Good nursery practices***

- cut back the branches of natural shade trees
- repair and replace shade material in time to prevent damage to seedlings
- regulate the amounts of shade and water together
- align beds or rows of plants with the sun's path
- add shade to the sides of the bed, or let shade cloth overhang, if sun is directly on plants most of the day
- gradually remove the shade as the plants grow
- observe how the plants react to shade removal and adjust your treatment as necessary

#### ***Poor, but common nursery practices***

- maintaining the seedlings in shade during the entire nursery production
- applying too much shade, as plants will grow more slowly and are more susceptible to diseases
- aligning plants opposite the sun's path
- removing the shade too quickly and burning the plants

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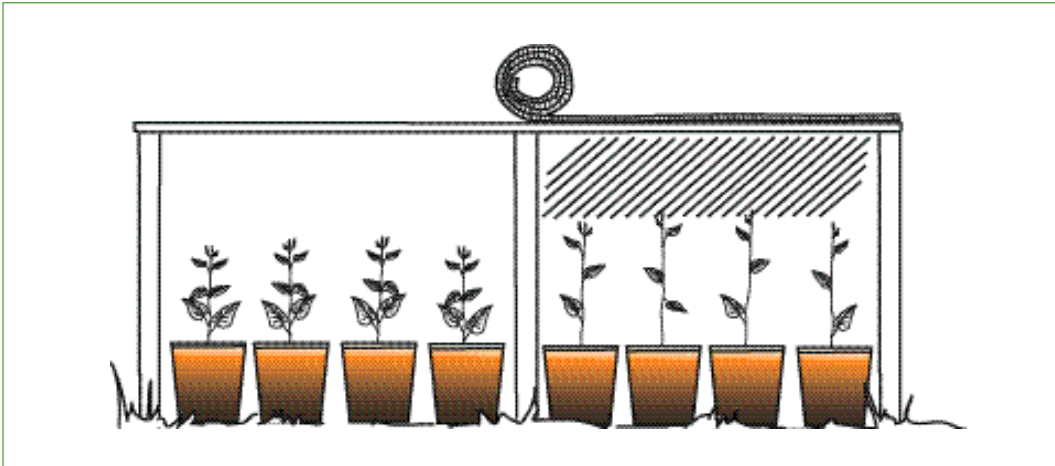
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