The Relationship Between Structure and Function in Seed Dispersal and Seed Germination©

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A seed can be defined as a dormant embryonic plant, neatly packed in a seed coat together with nutrient reserves required during germination. In structural terms, there is a vast variation in the size and shape of the embryo, the composition and quantity of the nutrient reserves, the construction of the seed coat and in some seeds also other floral structures surrounding the mature seed. These "other structures" are often included in the concept seed and to avoid any confusion, the term "propagule" is used when referring to such seeds. In this paper the term seed will be used in the strict sense and any additional structures surrounding the seed proper will be described and related to a possible function. The discussion will focus mostly on seeds of indigenous plant species, including seeds with arils, recalcitrant seeds, seed dormancy (exogenous and endogenous dormancy), seed banks, seeds of parasitic plants, and orchid seed.

Greenhouse Technology©

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Greenhouse technology has improved dramatically over the years. Two of the main criteria that have influenced the ability to grow crop in the greenhouse are the type of structure and the material covering the structure.

THE GREENHOUSE STRUCTURE

A good greenhouse can only be measured by its ability to cost effectively ventilate and to control both temperature and humidity. The most basic structure is a tunnel and the next step is a force-ventilated structure. Today, the most cost-effective type of structure is a naturally ventilated structure with a roof vent at the highest point of the apex. The size and position of the vent are of utmost importance to enable the structure to maintain an even climate for the crop.

The combination of natural ventilation together with high pressure fogging gives ultimate control coupled with low running costs. Natural ventilation combined with high pressure fogging works on the same principal as the pad and fan system. The objective is to increase humidity in order to lower temperature. For every 7% increase in humidity the temperature is lowered by ±1 ºC. The high pressure fogging system needs to produce droplets of an average of 10 µm. The droplet size is important to prevent wetting the plants and enable uniform cooling to take place throughout the greenhouse.

The system will start operating if the humidity is too low or the temperature is too high, thus giving the added advantage of increasing humidity when necessary. The result is a less stressed plant and better growth. The roof vent also enables the greenhouse to be dehumidified when heating is being used. This allows the greenhouse to operate at an optimum climate 24 h a day. The viability of projects is dependent on maximum production with the lowest possible running cost.

PLASTIC COVERING MATERIALS

Plastic Covering. Plastic films have long been used as greenhouse covering materials for protecting both vegetable and flower crops. In the past the main reasons were to protect the crop from rain, wind, and the night temperatures. Recent trends in greenhouse film production and new polymer science have targeted turning a film from a simple covering material into something that can enhance plant growth.

This is achieved by employing new manufacturing techniques and combinations of additives in order to manipulate sun radiation entering the greenhouse, heat emitted during the night, and various other parameters so as to effectively control the microclimate and positively influence the crop.

The main properties a greenhouse film should have are the following:

- Mechanical strength
- Long lifetime
- Suitable optical properties
- Thermic effect
- Anti-fogging effect
- UV-blocking effect
- Cooling effect

We shall discuss some of the parameters influencing the above properties.

Mechanical Strength. A film's initial mechanical strength is dependant upon:

- The selection of raw materials and enhancing the properties through co-extrusion.
- Processing conditions and blow-up ratio.
- Film thickness and uniformity of thickness. Generally all long-life films have a nominal thickness of between 150 and 200 µm.

Lifetime. The lifetime of the film depends on the climate of the area it is exposed to as well as the clamping technique used to secure it to the structure. The higher the kilo-langlays of exposure coupled with the temperature and chemicals used inside the greenhouse, the faster the rate of degradation. All the above will be influenced by the UV stabilisers and antioxidants which are used to protect the film. Most high quality films of ±180 µm produced around the world will carry a 36-month warranty with exposure to around 170 kilo-langlays per annum.

Optical Properties. The part of sunlight, which is useful for photosynthesis, is called photo active radiation (PAR) and falls between 400 and 700 nm. It is commonly known that 1% more light is 1% more growth. The total light is important but this needs to be coupled with diffused light. This means the plant will receive an even light transmission throughout the day without casting shadows.

Thermic Effect. Thermic films absorb infrared radiation emitted by the soil and the plants during the night and can increase night temperatures by up to 4 ºC. This, coupled with the possibility of double inflation on the greenhouse, can have up to 40% saving on heating costs.

Anti-fogging Effect. The water droplets formed on the inner surface of the greenhouse film caused by condensation drastically reduce the light transmission. Anti-fogging films contain special additives, which reduce the surface tension between the film and the water, thus creating a thin film of water instead of droplets. This film of water flows to the inside gutter and the result is more light and better growth for the plant when it is most required.

UV Blocking. Regular greenhouse films typically absorb UV radiation up to 350 nm. UV radiation from 350 to 380 nm is not blocked. Special UV blocking films have been developed which filter out UV radiation up to 380 nm. This will contribute to the control of certain fungus sporulation and pest control. Certain insects require this portion of light to navigate. UV blocking film should not be used when bees are being used for pollination.

Cooling Effect. The use of high diffusing films offers a moderate cooling effect. It is also possible to produce near infrared blocking films. These do not allow entry into the greenhouse of the near infrared radiation, which carries the sun's heat during the day. The additives required to perform this function are very expensive and it also has a negative effect on the usable light in the greenhouse.

CONCLUSION

Specialty plastic films produced with modern three-layer co-extrusion technology used in conjunction with naturally ventilated greenhouses will enable you to grow a high-value crop with a good return due to low running costs.

Environmentally Responsible Plant Production©

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INTRODUCTION

For many years the use of naturally produced organic pesticides have been debated against the use of synthetically produced organic and chemical agricultural remedies. Which direction is the right one to take? The use of organically certified products on the one hand resulted in produce that carries a high premium and affordable to the minority elite, where as the use of more economical chemical pesticides produce affordable produce for the masses. Technology at present is so advanced that today's chemical formulations available on the world market are in many cases less hazardous compared to many natural substances found in nature. At the same time many organic and biological pesticide formulations have become more affordable. Before selecting products for use in production one needs to do an assessment of risk.

Should pesticides be allowed that are isolated from nature (natural organic) or synthetically produced? Which of these pesticides should be made available for commercial use? To answer these questions one has to look where these pesticides fit in with the definitions of ecology, toxicology, toxicity, and hazard.

DEFINITIONS USED TO DETERMINE THE POSSIBLE RISK OF PESTICIDES

Ecology. This is the science of all levels of life in their relation to each other and to their environment. Man being at the top of the food chain is just as much part of the ecology as any other organisms and therefore must be recognized in the definition.

Toxicology. The science by which a qualitative and quantitative study is made to observe the alterations of structure and response in living systems caused by chemical and physical agents.