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Watermelon Seed Germination

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Seed Germination and Health for Triploid (Seedless) Watermelons

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Seedless watermelon have become popular with American consumers over the last 20 years. The fruit are crisp and sweet without the hard seeds of standard watermelon. The concept of seedless fruit seem to fit the lifestyle of consumers who have less time to prepare food and who eat out more often; seedless watermelon are popular in salad bars and fruit salads.

Seedless watermelon are produced from seed which have three sets of the necessary genetic material or chromosomes. These seed, known as triploid, have special germination requirements. This bulletin addresses triploid watermelon seed germination and transplant production. First, however, the process whereby seed for seedless watermelon are produced is briefly described.

An analogy can be used to explain how seedless watermelon are produced. Mules are sterile animals, much as seedless watermelon are sterile; no offspring (seed) are produced. Mules are produced when a donkey and a horse are crossed. However, since mules are sterile, the cross must be performed again to get another mule. Donkeys and horses are genetically similar enough to mate and produce offspring. However, the animals are genetically different enough that the offspring is sterile.

A similar process produces seedless watermelon. Standard watermelon plants (two sets of chromosomes) are crossed with plants that have had their chromosome number doubled (four sets of chromosomes) by the use of a plant derived chemical. The result is offspring, seeds, with three times the normal chromosome count. (These are the seed sold to growers who grow the watermelon we know as seedless.) In the process of reproduction, plants must halve the number of chromosomes before combining chromosomes with the other parent. Triploid plants have three sets of chromosomes; three can not be split evenly, therefore the plants are sterile. To produce more triploid seed, the cross of the genetically different parents must be performed again.

The triploid condition of the seed affects seed physiology, and therefore, the germination of triploid watermelon seed requires specific conditions of temperature and moisture. Most watermelon seed companies strongly recommend growing triploid watermelon seedlings as transplants. Direct seeding triploid seed usually results in poor stands. Transplants are usually grown in commercial soil mixes in polystyrene, plastic, or Styrofoam transplant trays.

The soil mix: The soil mix should be well drained and free of disease-causing organisms (pathogens). Most commercial potting soil mixes fit this description and perform well. These mixes are often referred to as “soilless mixes” since they are composed primarily of peat, perlite or vermiculite and sometimes bark or ash. These mixes usually come in bales or bags and have been pasteurized (sufficiently heated, to kill soil microorganisms capable of causing disease problems). Disease problems may result from contaminating the soilless mix with dirty tools, floors, or benches that might come into contact with the mix (See bulletin BP-61).

Soil temperature: It is critical that triploid watermelon seed be

germinated in soil mix warmed to 85˚ to 95˚F (30˚ to 35˚C). A soil thermometer is essential to germinating triploid watermelon seed. Best germination can be achieved if the soil mix is heated to the proper temperature prior to seeding. This may be achieved by adding soil mix to transplant trays and warming the trays 24 hours before seeding or adding warm water to the soil mix at seeding. To minimize soil cooling overnight, it may be desirable to cover the trays with a plastic covering (e.g., visqueen). The plastic must be removed before the sun shines on the trays to avoid excessive heat.

Two common methods of heating soil mixes are germination chambers and propagation mats. Germination chambers range from modified chick hatcheries to rooms built specifically for the purpose. Chambers should be well insulated and, as much as possible, distribute heat evenly between trays. Thermostatically controlled propagation mats are available from several companies. Alternatively, some systems provide for hot water to be piped in tubing under the greenhouse floor or bench. Care should be taken so that the applied heat does not dry out the soil mix too much.

Soil moisture: Triploid watermelon seed will germinate poorly (if at all) under the soil moisture conditions used for standard diploid (seeded) watermelon seed. The most common condition leading to poor triploid seed germination is too much water. The first 48 hours are the most critical. A good rule of thumb to follow regarding soil moisture for triploid watermelon seed germination is as follows: grasp a handful of the soil mix and squeeze. If one can squeeze water out of the soil as one would squeeze water out of a sponge, the mix is too wet. The soil mix should maintain its shape after being squeezed. If it falls apart after being squeezed, it is too dry. By far the more common mistake is to use mix that is too wet. Most growers are very surprised to see how dry the soil can be and still support triploid watermelon seed germination. Maintain the proper soil moisture by misting the soil surface as it dries out. Overhead irrigation with a standard nozzle will result in soil too wet for triploid watermelon seed germination.

FIG. 1. Seedlings are distorted as a result of seed coats sticking to the seed leaves (cotyledons).

The critical period: The conditions of temperature and moisture outlined above should be maintained for approximately 48 hours. Seeds germinated at 85˚F usually require a longer germination period than those incubated at 95˚F. There appears to be some interaction between soil and moisture: warmer temperatures may make up for too much soil moisture. When approximately one third of the seedlings have emerged, the seedlings should be introduced to moisture and temperature conditions more typical of standard diploid watermelon seeds (70 to 80˚F). If seedlings are kept at high temperatures too long, they may become tall and spindly.

Seed priming: Some growers have had success using seed priming to make triploid watermelon seeds less sensitive to water and temperature regimes. Seed priming is a process whereby seeds are partially germinated. Primed seeds often germinate in less time and more uniformly. Results may vary with watermelon variety, seed lot and priming process used.

Seed placement: Seed coats of triploid watermelons often stick to the seed leaves (cotyledons) distorting the seedling (Fig.1). Such seedlings may grow slowly and are sometimes unusable. Growers who hand seed flats and have noticed a high percentage of distorted seedlings may want to alter their seed placement. Seed coats are more likely to stick to seed leaves if the pointed (radical) ends of the watermelon seed are placed downwards. The best results have been obtained with the pointed end at a 45˚ or 90˚ angle upwards. My own experience has been that a horizontal placement of the seed is satisfactory.

Seedling health: Seedlings grown from triploid watermelon seed may be less vigorous than standard watermelon seedlings until they become well established. Under such conditions, seedlings may be more susceptible to disease. Care should be taken to promote germination as described above. In addition, successful growers will closely follow the guidelines outlined elsewhere for disease free transplant production (See bulletin BP-61). Some of these guidelines include:

- Practice good greenhouse sanitation.
- Use a soilless mix that drains well.
- Frequently inspect seedlings.
- Irrigate in the mornings so that leaf surfaces can dry.

Vegetable growers should ask their seed representatives about resistance/tolerance to specific diseases.

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