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Growing Seedless Watermelon [1]

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Fruit of standard seeded watermelon varieties may contain as many as 1,000 seeds in each fruit (Plate 1). The presence of seeds throughout the flesh makes the removal of seeds while eating difficult. The seeds in slices or chunks of watermelon sold in retail stores or salad bars are a nuisance. One reason that seedless grapes are more popular with consumers than seeded varieties is that the consumer does not have to be concerned with and inconvenienced by the seeds while the fruit is being eaten. With proper care, seedless watermelons have a longer shelf life than seeded melons. This may be due to the fact that flesh break-down occurs in the vicinity of seeds, which are absent, in seedless melons.

Hybrid seedless (triploid) watermelons have been grown for over 40 years in the United States. However, it was not until recently that improved varieties, aggressive marketing, and increased consumer demand created a rapidly expanding market for seedless watermelons. The seedless condition is actually sterility resulting from a cross between two plants of incompatible chromosome complements. The normal chromosome number in most living organisms is referred to as 2N. Seedless watermelons are produced on highly sterile triploid

Plate 1. Seedless watermelon (center), compared to seeded standard watermelon (left), and seeded icebox watermelon (right).

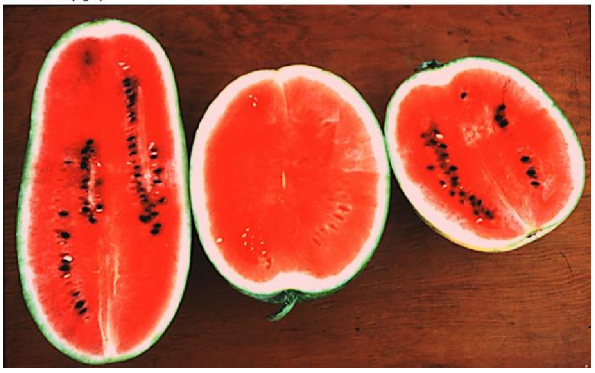

Plate 1.

(3N) plants which result from crossing a normal diploid (2N) plant with a tetraploid (4N). The tetraploid is used as the female or seed parent and the diploid is the male or pollen parent (Figure 1). As shown by the schematic drawing within figure 1, several steps are necessary in triploid watermelon seed production: a diploid (2N) female parent plant is treated with colchicine to produce the solid-colored female tetraploid (4N) parent; this is corssed with a striped male parent (2N) which results in triploid (seedless) watermelon seed(3N). To produce a crop of seedless watermelons, the triploid seed is interplanted with a pollenizer variety (2N). Since the

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tetraploid seed parent produces only 5 to 10% as many seeds as a normal diploid plant, seed cost is 10 to 100 times more than that of standard, open-pollinated varieties and 5 to 10 times that of hybrid diploid watermelon varieties. Tetraploid lines are usually developed by treating diploid plants with a chemical called colchicine.

Figure 1. Steps involved in triploid watermelon seed production.

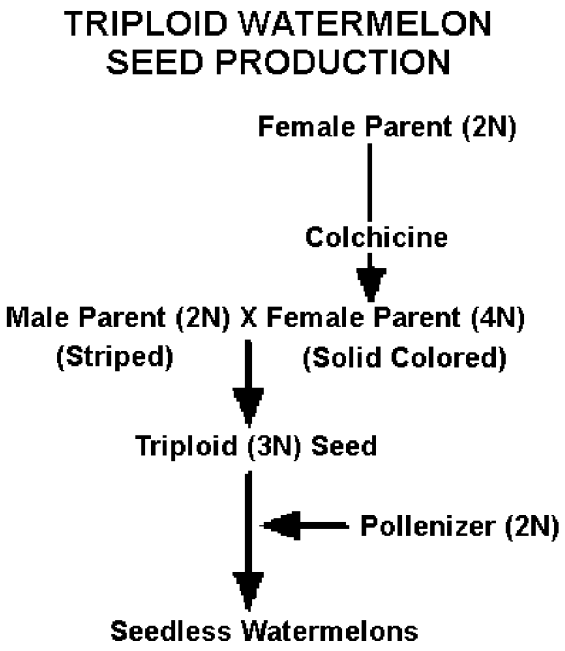

Figure 2.

Tetraploid parental lines normally have a light, medium, or dark-green rind without stripes. By contrast, the diploid pollen parent almost always has a fruit with a striped rind. The resulting hybrid triploid seedless melon will inherit a striped pattern (Plate 2). Growers may occasionally find a non-striped fruit in fields of striped seedless watermelons. These are the result of accidental self pollinations of the tetraploid seed parent during triploid seed production. Tetraploid fruit are of high quality but will have seeds and must not be sold as seedless. The amount of tetraploid contamination is dependent upon methods and care employed in triploid seed production.

Sterile triploid plants normally do not produce viable seed. However, small, white rudimentary seeds or seedcoats, which are eaten along with the fruit as in cucumber, develop within the fruit. The

Plate 2. Seedless watermelon showing striped rind pattern and absence of seeds.

Plate 2.

number and size of these rudimentary seeds vary with variety. An occasional dark, hard, viable seed is found in triploid melons. Seedless watermelons can be grown successfully in areas where conventional seeded varieties are produced. However, they require some very unique cultural practices for successful production.

FIELD ARRANGEMENT

Watermelon fruit set and enlargement is dependent upon growth regulators from the pollen grains and from embryos in developing seeds within the fruit. Inadequate pollination results in seedless watermelon fruit that are triangular in shape and of poor quality. Inadequate pollination may increase the incidence of *hollowheart* . Hybrid triploid watermelons do not produce sufficient viable pollen to induce fruit set and development. Therefore, pollen from a normal diploid seeded watermelon variety must be provided. Fields should be interplanted with pollenizer, diploid (seeded) watermelon plants to provide additional pollen. Planting the pollenizer variety in the outside row and then every third row (Figure 2) is the present recommendation. As an alternative, the pollenizer variety may be planted every third plant in a row but this makes harvesting a little more difficult. Under no circumstances should the pollenizer variety and the seedless variety be planted in separate but adjacent blocks!

It is important to use a pollenizer variety that is marketable because up to one-third of all melons produced in the field will be of this variety. The rind

Figure 2. Examples of two field arrangements of beds or rows which have been used successfully for seedless watermelon production.

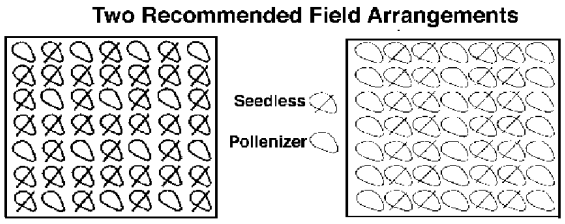

Figure 4.

pattern and/or shape of the seeded pollenizer fruit should be easily distinguished from that of the seedless fruit to reduce confusion at harvest. Selection of a pollenizer variety should also take into account market demand, plant vigor, pollen production, disease resistance, and environmental conditions.

It is important that pollen from the diploid pollenizer variety is available when female blossoms on the triploid plants are open and ready for pollination. As a general rule, direct field seeding of the pollenizer variety should be done on the same day the triploid seed is planted in the greenhouse. Small fruited, icebox varieties usually flower earlier than standard watermelon varieties. If icebox varieties are to be used as the pollenizer, then direct seeding should be delayed a week to ten days. The diploid pollenizer variety will frequently set fruit and stop producing male blossoms while the triploid variety is still producing many female blossoms. Growers may make a second planting of a pollenizer two to three weeks after the initial planting to provide pollen for the late-developing female blossoms. No consistent differences among any standard and icebox types in effectiveness of pollination have been noted. Icebox varieties used as pollenizers result in high early yields; standard varieties used as pollenizers result in high total yields.

Pollen from the pollenizer variety is carried to the triploid blossoms by insects, primarily honeybees. An adequate bee population in the field is needed to ensure that satisfactory pollination occurs. A minimum of six honeybee visits per flower is required for normal fruit development of seeded varieties. For triploid fruit development, at least as many, and perhaps more, visits are required. The general recommendation is to provide one bee for each 100 flowers in the field. Usually one strong colony of 20,000 to 30,000 bees for each two acres of watermelons provides satisfactory pollination. A grower of seedless watermelons should plan on at least the same, and perhaps a somewhat higher, bee population than has been successful in the past for seeded watermelon production. In addition, the grower might consider the application of a bee attractant to the triploid plants during the pollination period.

Occasionally, as many as 20 or more hard seeds are found in *seedless* fruit. These fruit with hard seeds are frequently from the first and second harvests. High numbers of hard seeds in early fruit may be the result of stress conditions such as drought, flood, fertilizer imbalance, or extremes in temperature.

VARIETY SELECTION

Seedless watermelon variety development is underway by a number of seed companies and new varieties, which may be superior to those listed below, are being released every year. Evaluation of seedless watermelon varieties at University of Florida Research and Education Centers in Leesburg, Bradenton, Live Oak, and Quincy have shown the following varieties to be well-adapted to production in Florida:

- **Crimson Trio.** Oval. Indistinct, wide, dark-green stripe on light-green background. Similar to Tri-X-313'.
- **Genesis.** Oval/round fruit with indistinct medium green stripes on a light-green background.
- **King of Hearts** . A mid-season hybrid with blocky, slightly oblong fruit weighing 14-18 lb. Solid fruit has a thick rind and a stripe pattern similar to 'Crimson Sweet'.
- **Merrilee III (W1025)** . Oval fruit with indistinct, wide, dark-green stripes on a light-green background. Similar to Tri-X-313. **For Trial.**
- **Millionaire** . Oval. Indistinct, wide, dark-green stripes on light-green background. Similar to Tri-X-313.

- **Scarlet Trio** . Oval fruit with thin, distinct, dark-green stripes on a lightgreen background.
- **Summer Sweet 2532.** Oval. Thin, distinct, dark-green stripe on light-green background. Similar to Queen of Hearts. 12 to 15 lb fruit. Tolerant: anthracnose.
- **Summer Sweet 5032.** Oval-round. Wide, indistinct, medium-green stripe on light-green background. 12 to 16 lb fruit. Resistant: anthracnose.
- **Summer Sweet 5244.** Oval. Indistinct, wide, dark-green stripes on light-green background. Similar to Tri-X-313. 14 to 18 lb. fruit. Tolerant: anthracnose.
- **Tiffany** . Round-oval. Wide, indistinct, dark-green stripe on medium-green background. Early.
- **Tri-X-313** . A mid-season hybrid available to Sunworld growers only. Fruit are oblong and have a medium-thick rind with a deep green background and darker green stripe. Fruit are ready 75-80 days after transplanting.

CULTURAL PRACTICES

Plant spacing requirements vary depending on variety selection, growing area, time of planting, and soil type. In general, early growth of triploid plants is slower than that of diploid plants. However, triploid plant size eventually exceeds that of standard diploid plants. Seed development in fruit of seeded varieties inhibits further flowering and fruit set. This inhibition does not exist in triploids; therefore, plants continue to produce fruit as long as viral infection does not occur and insects and foliar diseases are controlled. Triploid plant population density should be 10 to 20% less than that recommended for production of standard watermelon varieties. Beds spaced 9 ft. apart and 3 ft. in-row spacing has been used successfully at the Gulf Coast Research and Education Center.

All methods of irrigation including overhead, drip, seepage, and furrow are used successfully in producing seedless watermelons. Maintaining soil moisture at optimum levels is critical for seedless watermelon production. Water stress (drought) can increase the incidence of blossom-end rot and result in poorly shaped, bottle-neck fruit. Excessive field moisture has been associated with *hollowheart* , a disorder which seems to be more severe in some varieties of seedless melons than in seeded ones. Production of seedless watermelons offers a new opportunity for growers. As always, growers should establish a market before planting a new crop.