Techniques for Separating Tetraploid and Triploid Watermelon Seed and Effects of Some Priming Treatments on Germination

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ABSTRACT

Seeds of the commercial cultivar for seedless watermelons, TriX313, were separated into groups based on thickness in one experiment and on weight in another. Number of triploids and tetraploids were recorded for each category. There were no significant differences in ploidy levels based on either weight or seed thickness. Seeds from this same cultivar were treated with priming solutions of polyethylene glycol (PEG 8000), KNO_3, and distilled water for three lengths of time (1,3, or 6 days). The seed was subsequently air-dried for 1 or 7 days and then tested for germination and emergence.

INTRODUCTION

Seedless watermelons are produced from triploid seed. Triploid seed is produced by open-pollination of tetraploid plants with diploid pollinators. However, self-pollination of tetraploids results in tetraploid seed, while out-crossing results in triploid seed. Since cultivation of tetraploids is uneconomical, improvement in procedures for separating the seed by ploidy level could eliminate up to 25% of the unnecessary production of tetraploid fruit. In addition, germination (30 to 50%) of polyploid watermelon seed necessitates over-seeding and transplanting for stand establishment.

PROCEDURES

TriX313 seeds were placed into 6 categories, based on thickness. Measurements ranged from 1.4 to 3.1mm; each category had a range of 0.3mm. Seeds were germinated in a laboratory and transplanted into Speedling trays and subsequently transplanted to a field at Campus Agricultural Center in April 1987. Plants were scored as triploid or tetraploid according to genetic fruit markings; triploids are striped, and tetraploids are light green. For separation of seed by weight, TriX313 seed were placed into 18 categories. Measurements ranged from 21 to 110mg; each category had a range of 5mg. Seeds were planted into 5-gallon pots in the greenhouse in July, 1987. Female flowers were hand-pollinated and fruit-scored for ploidy level two weeks after fertilization.

TriX313 seed was pre-treated in aerated solutions of either PEG 8000, KNO_3, or distilled water for either 1, 3, or 6 days. Following this treatment, seeds were air-dried for 1 or 7 days. All seeds were dusted with Benlate to prevent fungal growth. When all treatments were complete, the seeds were placed into a germination chamber to test germination and emergence. For germination, seeds were placed on a moistened germination paper which was then folded in half and placed in a plastic zip-lock bag. The bag was left open to allow for air circulation. Bags were placed in the chamber using a completely randomized design.

For emergence, 20cm x 10cm x 6cm aluminum pans were prepared with 5cm of clean silica sand (#20). The seeds were placed 2cm apart in 3 rows and barely covered with sand. These were also placed in the chamber using a completely randomized design. Seeds were counted after 7 and 14 days to determine total germination and emergence.

RESULTS

Separation of triploid and tetraploid watermelon seed by weight and by thickness was not possible. Categories within each test contained too few melons to allow for statistical testing, but each category contained 3N and 4N plants. Tables 1 and 2 give the mean values of 3N and 4N seed used in this study.

The data for the seed priming experiment are incomplete; the results have yet to be analyzed. Trends show that water works better as a priming solution than KNO_3; however, KNO_3 works better than PEG. Treatment with PEG never resulted in higher germination or emergence than the control.

Table 1. Separation of Seed by Thickness

Ploidy	Mean size (mm)	Std. dev.	T-Test
3N	2.10	0.38	5.53
4N	2.10	0.38	5.53

Table 2. Separation of Seed by Weight

Ploidy	Mean wgt. (mg)	Std. dev.	T-test*
3N	67.88	23.39	3.17
4N	69.52	20.41	3.41

* $P > 80\%$; $z = .284 < t(.10) = 1.645$