

Effect of Processing Techniques and Storage on Water Melon (*Citrullus lanatus* Thunb.) Seeds

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ABSTRACT An investigation, to standardise the ideal seed extraction method for optimum seed quality in water melon cv. Sugar Baby, was undertaken at the Department of Olericulture, College of Horticulture, Vellanikkara. Seeds extracted after soaking the fruit pulp in 1% HCl for 30 minutes followed by drying the seeds initially in shade for one day and then in sun, avoiding peak hours showed maximum germination per cent (99.5), speed of germination (24.9) and vigour index (1086). Storage study revealed that open storage cannot be recommended for watermelon seeds.

Keywords: water melon, seed processing techniques, storage

The extraction of seeds from fleshy fruits like watermelon is cumbersome since seeds are embedded in the pithy placenta. In such cases the common practice is to scoop out the seeds manually along with placenta and to clean the seeds by repeated washing. Very little information is available on the seed extraction aspects of fleshy-fruited vegetables. Hence an investigation was undertaken at the Department of Olericulture, College of Horticulture, Vellanikkara to standardize the seed extraction and drying methods and to study the effect of storage on seed quality.

MATERIALS AND METHODS

Seeds were extracted from fully matured fruits of uniform size of watermelon cv. Sugar Baby by seven different methods, viz., E₁-Manual extraction, without fermentation, E₂-Manual extraction, with fermentation for 48 h, E₃-Machine extraction without fermentation, E₄-Machine extraction with fermentation for 48 h, E₅-Manual extraction with 1% HCl treatment for 30 minutes (w/w basis), E₆-Manual extraction with 2% HCl treatment for 30 minutes (w/w basis) and E₇-Manual extraction with 1% NaOH solution equal to the weight of pulp for one night.

The seeds obtained from each method were subjected to the following four different drying methods till the moisture content reached 7%.

Different drying treatments include D₁-Drying under shade, D₂-Drying in direct sunlight, D₃-Drying in hot air oven at 35°C and D₄-Initial drying in shade for one day and then in sun, avoiding peak hours (12 noon to 3 pm.)

Thus the total number of treatments were 28 with 2 replications. The processed seeds were stored under ordinary room temperature for one year and quality parameters like germination percent, speed of germination and vigour index were tested at monthly intervals.

The mean number of normal seedlings produced was recorded on 10th day and expressed as germination per cent. Vigour index was computed by adopting the formula [1] and expressed as whole number.

Vigour index = germination per cent × mean length of root and shoot (cm).

Speed of germination was calculated using the following formula.

$$\text{Speed of germination} = \frac{X_1}{Y_1} + \frac{X_2 - X_1}{Y_2} + \dots + \frac{X_n - X_{(n-1)}}{Y_n}$$

Where X_n is the percentage germination on nth day and Y_n is the number of days from sowing.

Statistical analysis of the data was carried out using standard package MSTATC in CRD.

Table 1. Effect of extraction method on seed quality of watermelon

Treatments		Seed quality parameters		
Extraction method	Drying method	Germination (%)	Speed germination	Vigour index
Manual	Shade	91.7	3.7	558
	Sun	69.4	1.1	276
	Oven	67.7	2.9	452
	Shade (1d)+Sun	99.0	5.2	786
Manual+ Fermentation	Shade	97.5	18.5	943
	Sun	87.5	18.2	802
	Oven	81.0	16.7	819
	Shade (1d)+Sun	97.5	20.2	1010
Machine	Shade	92.7	4.4	774
	Sun	62.4	3.4	598
	Oven	44.2	5.0	301
	Shade (1d)+Sun	80.2	8.95	932
Machine+ Fermentation	Shade	94.2	22.1	851
	Sun	87.9	15.8	738
	Oven	94.2	16.5	690
	Shade (1d)+Sun	86.4	21.1	677
Manual+ 1% HCl	Shade	97.5	24.5	861
	Sun	92.5	18.3	798
	Oven	87.5	20.9	792
	Shade (1d)+Sun	99.5	24.9	1086
Manual+ 2% HCl	Shade	94.2	11.2	743
	Sun	26.9	8.0	140
	Oven	66.7	11.6	470
	Shade (1d)+Sun	81.2	20.3	666
Manual+ 1% NaOH	Shade	86.9	21.6	790
	Sun	85.4	21.4	858
	Oven	85.5	18.1	772
	Shade (1d)+Sun	98.5	24.1	934
	CD (P=0.05)	23.1	6.1	206.2

RESULTS AND DISCUSSION

Effect of extraction method on seed quality of watermelon is shown in Table 1. The maximum germination of 99.5 per cent was recorded in seeds,

which were manually extracted using 1% HCl for 30 minutes and dried initially in shade for one day and then in sun, avoiding peak hours. This was on par with the seeds which were extracted manually with fermentation, manually using 1% NaOH and

dried in the same way. The lowest germination of 26.9 was noted in seeds that were extracted using 2% HCl, followed by drying in direct sunlight.

The highest speed of germination (24.9) was recorded in seeds, which were manually extracted using 1% HCl and dried initially in shade for one day and then in sun, avoiding peak hours. Seeds extracted in the same way and dried under shade or in oven also showed superior values. The speed of germination was lowest for all the seeds extracted manually or mechanically without fermentation, irrespective of drying methods.

The highest vigour index of 1086 was recorded in seeds, which were manually extracted using 1% HCl for 30 minutes followed by drying initially in shade for one day and then in sun, avoiding peak hours. This was on par with the seeds that were extracted manually with fermentation, followed by drying in shade or dried in shade for one day and then in sun avoiding peak hours. Seed extracted in machine without fermentation or extracted manually using 1% NaOH, followed by drying initially in shade for one day and then in sun, avoiding peak hours performed similarly. The vigour index was lowest (140) for seeds extracted using 2% HCl and dried under direct sunlight.

Seeds extracted using 1% HCl for 30 minutes followed by drying initially in shade for one day and then in sun, avoiding peak hours showed maximum germination per cent (99.5), speed of germination (24.9) and vigour index (1086). Seeds extracted manually with fermentation for 48 hours or using 1% NaOH and dried initially in shade for one day and then in sun avoiding peak hours also showed superior values for germination, speed of germination and vigour index. Manual extraction with fermentation for 48 hours is the farmers' practice of seed extraction in Kerala, which is time consuming. Treatment with 2% HCl was inferior, producing poor quality seeds compared to 1% HCl. High concentration may be injurious to seeds thus resulting in poor quality. Manual extraction using 1% NaOH was better resulting in good quality seeds. The superiority of alkali in washing seeds of fleshy fruited vegetables had been reported earlier (2). Extraction using 1% HCl was very fast compared to these two methods. Many workers have reported superiority of acid method of seed extraction in improving the germination and vigour of the seeds [3,4,5]. The acidity might have destroyed or neutralized some of the germination inhibiting factors present around the seed. Treatment with concentrated HCl also detaches the seeds quickly

from the adhering pulp. In all these treatments, better performance was obtained when the seeds were initially dried in shade for one day and then in sun, avoiding peak hours. Oven drying and sun drying always resulted in poor quality seeds. The superiority of combined sun and shade drying had been reported in tomato seed germination. Better performance of shade drying avoiding peak hours could be due to the slow drying procedure without exposure to continuous radiation effects.

The processed seeds were subjected to a storage study for the period of 9 months and the mean values of germination (%), speed of germination & vigour index are presented in Table 2.

Table 2. Effect of storage on seed quality

Months after storage	Germination (%)	Speed of germination	Vigour index
1	83.4	24.6	726
2	69.9	17.7	552
3	70.1	13.7	539
4	48.3	12.9	360
5	48.1	12.7	315
6	24.2	8.5	160
7	22.1	6.0	141
8	21.8	5.9	127
9	28.5	5.8	119
CD	6.6	2.88	77.2

Seed quality parameters drastically reduced during storage. Germination per cent reduced from 83.4 after one month, to 28.5 by 9 months of storage. By fourth months, germination per cent reduced to 48.3, which is below the required minimum germination of 60%.

Similar to germination percent, speed of germination and vigour index also reduced due to storage. Speed reduced from 24.6 at one month after storage to 5.8 at 9 month. Vigour index reduced from 726 at one month after storage to 119 at 9 months of storage.

Though the study was planned for a period of one year, the watermelon seeds did not germinate after 9 months of storage.

From the study, it is evident that watermelon seeds cannot be stored under ordinary room temperature, as it resulted in poor quality seeds by the 4th month of storage.

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