Post-Harvest Seed Maturation in Bittergourd

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ABSTRACT

Ripening fruits of bittergourd (*Momordica charantia* L.) are prone to cracking and bird damage leading to field loss of seed. Post-harvest seed maturation of cv. MDU 1 was evaluated. Several seed quality parameters revealed that seeds matured in fruits which were harvested before ripening and stored under ambient conditions. Harvesting fruits three days before full ripening and storing under ambient conditions for four days before extracting seeds enabled field losses to be avoided and high quality seeds to be obtained.

***Additional index words: Momordica charantia,* seed quality, fruit ripening, harvest time.**

INTRODUCTION

The dry weight of developing seed can be used to assess its maturity (Delouche, 1973). In bittergourd (*Momordica charantia* L.) cv 'Coimbatore Long', maximum dry weight was recorded 30 days after anthesis (Varatharaj, 1979). Ripening bittergourd fruits are prone to bird damage and fruit cracking leading to field loss of seeds. One of the means of obviating this loss would be to harvest the fruits a few days before full ripening and allowing them to mature off the plant. The present study was designed to evaluate post-harvest seed maturation in bittergourd fruits.

MATERIALS AND METHODS

The study was made with bittergourd cv 'MDU 1'. A bulk crop was raised in the monsoon season of 1989. Preliminary observations revealed that the fruits of bittergourd cv 'MDU 1' took 28 days after flowering for full ripening, by which time the fruits had turned yellowish orange. Fruit harvesting and seed extraction was carried out as follows:

A - Harvesting ripened fruit and extracting seed immediately.

B - Harvesting fruits three days before full ripening when a mild orange tinge appeared in warts at the distal end of the fruit (25 days after flower opening) and extracting seed either immediately, two days, four days or six days after harvest.

C - Harvesting fruits six days before full ripening (22 days after flower opening) and extracting seed either immediately, two days, four days or six days after harvest.

Ten fruits were harvested for each replicate of each treatment, and kept in a room under ambient conditions (23-32°C). There were nine treatments in all. A completely randomised design with three replications per treatment was employed.

Manually extracted seeds were washed well with water and the seed moisture content determined (ISTA, 1985) after blotting off surface water. Remaining seeds were initially shade dried, then sun dried until the seed moisture reached eight per cent and evaluated for the following parameters:

One hundred seed weight: Four samples of 100 seeds each were weighed.

Seed coat/embryo ratio: Seed coats and embryos were weighed separately. The seed coat/embryo ratio was derived by dividing the seed coat weight by embryo weight.

Germination: A total of 10 x 10 seeds from each treatment and replication were sown in sand medium at 2 cm depth in plastic buckets of 30 cm height. The buckets were kept at 25°C constant. The number of normal seedlings were counted on the 14th day and expressed as percentage germination.

Epicotyl, hypocotyl and root lengths of seedlings: Ten normal seedlings were randomly selected from each treatment and replication of the germination test, and the epicotyl, hypocotyl and root lengths measured.

Dry weights of seedlings: The seedlings used for length measurement were shade dried for 5 h, and subsequently dried in an air-oven maintained at 85°C for 24 h. They were then cooled in a desiccator for 30 min and the dry weight of seedlings was determined.

Electrical conductivity of seed leachate: Ten seeds were soaked in 100 ml of glass-distilled water for 4 h at 25°C and the electrical conductivity of leachate was measured using an EC meter Model MCD No. 287 (M.C. Dalal Agencies, Madras, India). The measurement was made at 25°C in duplicate for each treatment and replication.

Field emergence: Two x 50 seeds from each treatment and replication were sown in rows in raised beds. A spacing of 5 cm between rows and 3 cm between seeds within a row was maintained. The number of seedlings at 15 days after sowing was counted and percentage field emergence was estimated.

Statistical analysis: The data were analysed using the F test for significance. For germination data lying within the range of 74-90, a square-root transformation was used. For field emergence data with a range of 50-71, angular transformation was employed (Gomez and Gomez, 1984).

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RESULTS AND DISCUSSION

Seed moisture decline during seed maturation is common in many crops (Loewenberg, 1955; Culpepper, 1973). In the present study, moisture was reduced significantly in the seeds extracted after a few days of fruit storage (Table 1). The rate of water loss in the seeds was the same in detached fruit as for those still on the parent plant. Moisture content of seeds extracted immediately from fruits fully ripened was similar to that of seeds in fruits harvested three days before full ripening and stored for four days, and with that of seeds in fruits harvested six days before full ripening and stored for six days.

Seed weight increased significantly during fruit storage when the fruits were harvested six days before ripening. Seed weight is a function of embryo development and accumulation of dry matter (Agrawal and Kaur, 1977) and is often used as a parameter of seed quality (Maguire, 1977). It is evident from the present study that dry matter accumulation occurred in the seeds during post-harvest fruit storage.

No differences in the seed coat/embryo ratios were observed, probably because the time frame of the present study was too short to allow any significant change. Similarly, seed germination did not differ significantly.

Dry weight of seedlings increased significantly as seeds ripened in fruits harvested six days before ripening (Table 1). Seedling dry weight reflects the rapidity with which the seedling grows into the antotrophic stage and can be an index of seedling vigour (Kittock and Law, 1968). Epicotyl, hypocotyl and root length of seedlings were measured but the differences were not significant (data not given), despite significant variations in dry weight.

Table 1. Quality parameters of seeds matured after fruit harvest in bittergourd cv 'MDU 1'.

Treatment	Seed moisture (%)	100-seed weight (g)	Seed coat/ embryo ratio	Germination %	Dry weight of 10 seedlings (g)	EC ds/m/10 seeds/ 100 ml water	Field emergence %
Harvesting fully ripened fruit and extracting seed immediately	37.4	32.62	0.648	82.0	1.474	26.2	64.7 (53.6)[1]
Harvesting 3 days before full ripening and extracting seeds:							
Immediately	39.9	32.49	0.696	80.0	1.465	31.4	60.7 (51.2)
2 days later	38.5	32.44	0.728	78.7	1.472	28.7	65.3 (53.9)
4 days later	37.1	32.64	0.686	79.3	1.490	24.7	66.0 (54.3)
6 days later	36.6	32.64	0.655	86.0	1.487	23.8	68.0 (55.6)
Harvesting 6 days before full ripening and extracting seeds:							
Immediately	43.4	31.58	0.711	79.3	1.356	34.7	51.3 (45.7)
2 days later	41.8	32.30	0.675	80.0	1.380	28.9	56.7 (48.8)
4 days later	39.2	32.62	0.661	80.7	1.470	25.2	63.3 (52.7)
6 days later	37.9	32.59	0.655	82.0	1.483	25.4	66.7 (54.7)
LSD (0.05)	1.6	0.40	NS	NS	0.050	2.2	(2.8)

[1]Angular values;NS - Not significant

Electrical conductivity (EC) of seed leachate was reduced as seed extraction from harvested fruit was delayed, indicating that the integrity of membranes was enhanced during this period. Such a trend during seed maturation was reported by Gray and Ward (1987) in onion (*Allium cepa* L.). EC of leachate is also a function of solute content which may increase during seed development. Consistent reductions in EC values in the present study reveal the overriding

influence of membrane integrity in maturing seeds.

Field emergence of seeds improved after fruit storage prior to seed extraction, despite the fact that germination did not differ. This response may have been related to seed vigour, as the EC data appear to correlate well with field establishment, but this was not confirmed.

This study clearly revealed that seed maturation occurred in bittergourd fruits harvested before full ripening and stored under ambient conditions. Harvesting fruits three days before full ripening when a mild orange tinge appeared in warts at the distal end of the fruit, storing them in a room under ambient conditions for four days, and then extracting the seeds, is a harvesting technique which will eliminate field loss of seeds in bittergourd. Harvested fruits cannot be stored beyond four days under ambient temperatures since they start decaying. Harvesting earlier than three days before ripening is not recommended because there are no visible signs on the fruits and there is therefore a risk of harvesting very immature fruits and seeds.

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