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Effect of Seed and Fruit Position on Seed Quality in Ash Gourd (*Benincasa hispida* (Thunb.) Cogn.)

MURUGESAN. P. AND K. VANANGAMUDI*
National Research Centre for Oil Palm, Pedavegi - 534 450

ABSTRACT Ash gourd seed crop was raised during July, 2002 to study the effect of fruit and seed position in the vine coupled with their maturity for getting quality seed. The results revealed that seeds from peduncle segment fruits produced low germination. The seeds, which are extracted from top, positioned fruits (46 and above node) outperformed middle (37-40th node) and bottom (27-30th node) positioned fruits in terms of seed germination. This study also confirmed that harvesting of fruits at 70 Days After Anthesis (DAA) was found to be correct and suitable stage for best seed quality in rainy season crop.

Among various external and internal factors, seed development and seed position are two intrinsic factors that determine seed performance. The quality of seed in fleshy-fruited species is enhanced when they acquire maximum dry weight [1] and seeds continue to develop and mature in the fleshy fruits until they get extracted from fruits [2]. Fruit development and seed maturation may occur independently, thus seed harvested at the same time can be at different developmental stages [3]. Seed performance is also associated with seed position. The position of a seed is determined by the position of the ovules within the fruit and fruit positions on the mother plant. Based on studies in species with a linear arrangement of ovules within the ovary such as legumes and cucurbits, seed position effects may involve male gametophytic selection [4]. To get successful seed performance the combined effect of seed development and seed position has to be studied [5]. The seeds produced at different position would influence not only the yield but also the quality of the seeds.

In cucumber, seeds extracted from fruits emerged early on the lower nodes of main stem showed best seed quality as reported by Abramova [6]. Seed position inside the developing muskmelon fruit affects seed development similar to that of fruit position [4]. Doijode [7] also conducted experiment to study the influence of position of seeds in the squash fruit and reported that early emergence, better germination and seedling growth was observed in the seeds extracted from first quarters of the fruit when compared to other position towards pedicel end. Effect of fruit and seed position on seed quality in ash gourd has not been reported in India and elsewhere. Hence, this study was conducted with an objective aimed to recommend correct fruit and seed position in the vine coupled with their maturity for getting quality seed material.

MATERIALS AND METHODS

This study was conducted on ash gourd cv.CO 2 seed crop raised during July, 2002 in rainy season at Tamil Nadu Agricultural University, Coimbatore. Fifteen pistillate flowers for each fruit to be harvested were tagged on the nodes in the bottom (27-30th node), middle (37-40th node) and top (46 and above node) positions of the mother plants. The node numbers were fixed based on flowering pattern as reported by Kamalanathan *et al.*, [8]. Root bearing nodes that were completely attached with soil was not taken into account for all the treated plants. Fruits having different stages viz., 30, 40, 50, 60 and 70 days after anthesis (DAA) were harvested for each fruit position. After harvest, the seed bearing part (seed cavity) was further dissected into three segments of equal length namely peduncular, intermediate and stylar.

* Adhiparasakthi Agri. College, Kalavai, Vellore-632 506

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Seeds together with mesocarp were removed and washed repeatedly in running tap water. After removing adhered mucilage completely, seeds were dried at room temperature for three days to get ten per cent moisture content. Afterwards, the seeds from different fruit and seed positions were analysed for seed moisture content, total seed dry weight, and germination. The seeds extracted from respective position were cleaned manually and placed in paper towels to remove external moisture and each sample was subjected to oven drying at 60°C for 36 h and dry weight was estimated. The moisture content of the seed was estimated by low constant temperature (drying at 105°C for 16 h) oven method [9].

Germination test was conducted using sand medium in germination room maintained at 25°C and 100% RH. Final count was taken at fourteenth day and number of normal seedlings alone counted and expressed in percentage. The data obtained were analysed statistically following completely randomized block design.

RESULTS AND DISCUSSION

At all the stages the moisture content of the seeds from peduncular portion was significantly higher (mean 41.1%) as compared to either intermediate (37. 2%) or stylar (36.4%) portion. Over all moisture content of the seeds from the middle node fruits was higher (44%) followed by top node (41%) while bottom node fruits had lowest moisture content (30%). Possibly this was due to meteorological conditions and irrigation schedule. However, at maturity (70DAA) the moisture content of seeds of bottom and top node fruits was same (30.8 - 30.9 %) while from the middle node fruits still had higher moisture content (39.5%). There was gradual decline in moisture content of seeds (from 52.4 to 33.7%) with increasing DAA (Table 1)

There was gradual increase in the total seed weight with increase in DAA. At maturity (70 DAA) the total seed weight of top node fruits was more (40.5g) compared to bottom and middle node fruits (37-37.3g), which could be due to meteorological condition. However, the seeds of intermediate segment had maximum total seed weight followed by stylar and the peduncular portion (Table 2). The seeds from top node fruits showed significantly higher germination (91.3%) at maturity compared to middle and bottom nodes (88.5-88.9%). Seed quality of stylar portion was better (90.6%) followed by intermediate and peduncular portion (87.7 and 88.4%), respectively (Table 3). Peduncular segment in all the fruit position showed higher moisture content in all the stages. Such differences of seed moisture content in peduncular fruits were also observed in marrow, which were recorded at 65 DAA, as reported by Demir [10].

In present study, total dry weight of ash gourd seed increased steadily and reached a maximum at 70 DAA except for peduncular segments. During the initial stages (30 DAA), basal fruit was the best, recording higher seed dry weight compared to middle and top fruits. But as the maturity stages increased, top fruits had more seed dry weight than remaining position. The results confirmed the variation in seed dry weight, germination and emergence as observed in the present study. After 40 DAA, seeds from three positions showed differences in the accumulation of dry weight and germination percentage. Hence, there was a difference in seed quality in the early maturity stage prior to mass maturity, which was revealed by germination. Seed quality variation due to position is in agreement with the performance of muskmelon seeds observed by Welbhaum *et al.*, [11]. In cucumber also, similar results were reported by Nerson [12]. Seeds from peduncular segments produced low germination. Seeds from top fruits outperformed middle and bottom fruits. The mature seeds from top fruits were heavier than those from middle and bottom. Demir and Ellis [1] observed lower seed quality within the position, might be due to dominance effects of top fruits over the others [13]. The poor performance from the peduncular segment of a fruit might be a result of fertilization with slow germinating pollen, which might in turn show low germination and vigour than that of fertilizing ovules at the stylar end of the ovary.

In ash gourd, variation due to position of fruits and segments exhibited more during the early stages it prolonged upto 60 DAA. Variation in seed quality was minimum after 70 DAA. Overall results revealed that performance of seeds from 70 DAA was excellent when compared to other stages. Hence, prolonged maturation of seeds inside the fruit is beneficial for seed quality point of view. This study also confirmed that harvesting of fruits at 70 DAA is a correct and suitable stage for best seed quality in rainy season crop.

From this study, it is very clear that in species with linear arrangement of seeds within the fruits, seed position may influence seed quality, which is affected by gametophytic selection. Ovules present in the peduncular segment had lesser opportunity

Table 1. Moisture content (%) of seeds extracted from the peduncular (P), intermediate (I) and stylar (S) segments of bottom, middle and top fruits harvested during development and maturation of ash gourd cv. CO 2 in rainy season

Days after anthesis (DAA)	Bottom (B)				Node position of fruit (N) Middle (M)				Top (T)				Segment Mean			Grand Mean
	Fruit segments (S)															
	P	I	S	Mean	P	I	S	Mean	P	I	S	Mean	P	I	S	
30	39.5	30.7	28.1	32.8	60.5	59.0	56.4	58.6	69.8	65.3	62.3	65.8	56.6	51.7	48.9	52.4
40	30.5	27.8	25.8	28.0	43.2	42.2	41.0	42.1	48.4	36.7	33.2	39.4	40.7	33.3	33.3	36.5
50	30.1	27.0	26.0	27.7	41.2	40.0	39.7	40.3	40.1	34.6	34.2	36.3	37.1	33.9	33.3	34.8
60	31.7	30.0	30.0	30.6	41.2	40.0	39.8	40.3	36.8	31.3	30.2	32.8	36.6	33.7	33.3	34.6
70	31.7	31.0	30.0	30.9	40.1	39.2	39.2	39.5	32.1	30.1	30.1	30.8	34.6	33.4	33.1	33.7
Mean	32.7	29.3	28.0	30.0	45.2	44.0	43.2	44.1	45.4	39.6	38.0	41.0	41.1	37.2	36.4	

	D	N	S	D x N	D x S	N x S	D x N x S
SEd ±	0.29	0.22	0.22	0.50	0.50	0.39	0.87
CD (P=0.05)	0.57	0.44	0.44	0.99	0.99	0.77	1.72

Table 2. Total seed dry weight (g) of seeds extracted from the peduncular (P), intermediate (I) and stylar (S) segments of bottom, middle and top fruits harvested during development and maturation of ash gourd cv. CO 2 in rainy season

Days after anthesis (DAA)	Bottom (B)				Node position of fruit (N) Middle (M)				Top (T)				Segment Mean			Grand Mean
	Fruit segments (S)															
	P	I	S	Mean	P	I	S	Mean	P	I	S	Mean	P	I	S	
30	28.2	31.4	30.2	29.9	22.1	27.0	25.2	24.7	20.4	26.1	25.1	23.9	23.6	28.1	26.8	26.2
40	33.0	36.6	35.1	34.9	32.1	34.0	34.0	33.4	31.0	38.0	36.1	35.0	32.0	36.2	35.0	34.4
50	35.2	39.2	38.0	37.5	33.7	36.0	38.0	35.9	35.0	39.1	38.0	37.4	34.6	38.1	38.0	36.9
60	35.2	39.5	37.6	37.4	35.0	37.5	38.2	36.9	37.2	40.1	39.6	38.9	35.8	39.0	38.4	37.7
70	36.0	39.0	37.0	37.3	36.0	37.0	38.0	37.0	39.0	41.4	41.0	40.5	37.0	39.1	38.7	38.3
Mean	26.5	37.1	35.6	35.4	31.8	34.3	34.7	33.6	32.5	36.9	35.9	35.1	30.2	36.1	35.4	

	D	N	S	D x N	D x S	N x S	D x N x S
SEd ±	0.32	0.25	0.25	0.56	0.56	0.43	0.97
CD (P=0.05)	0.64	0.49	0.49	1.11	1.11	0.87	1.93

Table 3. Germination (%) of seeds extracted from the peduncular (P), intermediate (I) and stylar (S) segments of bottom, middle and top fruits harvested during development and maturation of ash gourd cv. CO 2 in rainy season

Days after anthesis (DAA)	Bottom (B)				Node position of fruit (N) Middle (M)				Top (T)				Segment Mean			Grand Mean
	Fruit segments (S)															
	P	I	S	Mean	P	I	S	Mean	P	I	S	Mean	P	I	S	
40	36.0	46.5	51.1	44.5	35.2	45.2	49.2	43.2	32.0	33.0	55.5	40.1	34.4	41.6	52.0	42.6
50	85.1	88.2	88.9	87.4	80.2	86.0	88.0	84.7	89.5	89.0	89.5	89.3	84.9	87.7	88.8	87.1
60	85.2	88.0	90.0	87.7	87.0	88.5	89.5	88.3	90.1	91.0	90.0	90.4	87.4	89.2	89.8	88.8
70	87.6	89.0	90.0	88.9	87.1	89.0	89.5	88.5	90.5	91.2	92.2	91.3	88.4	89.7	90.6	89.6
Mean	73.5	77.9	80.0	77.1	72.4	77.1	79.0	76.1	75.7	76.0	81.7	77.8	73.8	77.0	80.3	77.0

	D	N	S	D x N	D x S	N x S	D x N x S
SEd ±	0.13	0.10	0.10	0.24	0.24	0.18	0.41
CD (P=0.05)	0.27	0.20	0.20	0.47	0.47	0.36	0.81

for fertilization than stylar segment, that is why the performance of seeds from peduncular portion is less. In predominantly cross-pollinated crop having linear seed arrangement, the influence gets multiplied. Hence, it is concluded that the ash gourd fruits from the top nodes (46 and above node) could be utilised for seed purpose and from the bottom (27-30th node) and middle fruits (37-40th node) could be utilised for vegetable purpose.

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