Annals of Plant and Soil Research 17(4): 409-412 (2015)

STANDARDIZATION OF OPTIMUM STAGE FOR PHYSIOLOGICAL MATURITY IN SNAKE GOURD

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Receive: July, 2015; Revised accepted: October, 2015

ABSTRACT

The present investigation was carried out at College of Horticulture, Vellanikkara during rabi season of (2010-2011)with the objective of standardising the optimum stage of fruit harvest for better seed quality in snakegourd (Tricosanthes anguina L) variety "Baby". Results indicated that fruits attained maximum weight (474.83 g) and length (37.32 cm) when harvested at 36 days after anthesis. Seed quality parameters viz.seeds per fruit and dry weight of seeds were found to be significantly highest at 36 days after anthesis with values of 58.70, 15.90 g, respectively. Germination percent (84), speed of germination (9.14), seedling length (23.57 cm) and vigour index (1980) were found to be maximum in seeds extracted from fruits harvested at 36 days after anthesis. Thereafter, a decrease was observed for these characters suggesting that 36 days after anthesis is the optimum physiological maturity stage of fruit for attaining maximum seed quality in snake gourd var. Baby. Morphological characters of the fruit at this stage changed fruit colour turning red at the tip portion and the placenta colour changing to red. Seeds got detached from the mucilaginous placenta and seed coat became hard with well-developed ring on the seed surface.

Keywords: Maturity, fruit colour, placenta colour, germination, vigor index.

INTRODUCTION

Snake gourd (*Tricosanthes anguina* L) occupies a place of pride among cucurbitaceous vegetables grown in south India and in Kerala. It is cultivated in garden lands. The quality seed is a prerequisite for obtaining high productivity.The demand for quality seed of snake gourd is on the rise. Seed quality is influenced by the maturity of fruit and general studies pointed out that seeds attain maximum quality when fruits are harvested at theoptimum physiological maturity.Early or delayed harvesting of fruits result in low seed vigour. There is no systematic study on the standardization of optimum stage for maturity in snake gourd and hence the present investigation was carried out as it would be of immense use for selecting optimum stage for physiological maturity in snake gourd.

MATERIALS AND METHODS

The present investigation was carried out at the College of Horticulture, Vellanikkara during rabi season of 2010-2011. During flowering, the female flowers were tagged on the day of flower opening (anthesis). Developing fruits from the tagged flowers were harvested at three days intervals starting from 21st day after anthesis up to 45th day and were designated serially as T_1 to $T_{9.}$ Ten fruits per replication were harvested at each maturity group for observing fruit and seed characters. The design of experiment adopted was a Complete randomized design with three replications and nine treatments from 21 DAA to 45 DAA (different maturity group). Morphological description of fruits at various stages of fruit development such as colour, smoothness and hairiness of fruit skin etc. was recorded at each stage. Similarly, the physical appearance of the seeds and colour were also recorded. The weight of the 100 seeds drawn randomly from each group was recorded.Germination percentage was assessed adopting the sand method and speed of germination (SG) was calculated by the method suggested by Agarwal (2000).The length between collar region and tip of the root was measured as root length of seedling and expressed in centimeter .The length between collar and base of the primary leaf was measured as shoot length of seedling and the mean computed and expressed in centimeter .Seedling length was measured from the tip of the root to base of the primary leaf and the mean computed and expressed in centimeter.The Vigour Index (VI) was calculated by adopting the method suggested by Abdul-Baki and Anderson (1973).

RESULTS AND DISCUSSION

Morphological changes in snakegourd fruits of variety "Baby" studied at various developmental stages with respect to colour of fruit skin and flesh are given in Table 1. Initially, the fruit was white in colour having light hairs on fruit skin with creamy white and firm placenta. Later, fruit colour changed to light red and red. Colour of placenta turned from white to light orange, and finally red. The texture of

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Table 1: Morphological characters of fruits at different stages of development in snake gourd variety (Baby)

Maturity stage	Morphological characters of fruits in Baby
T_1 (21 DAA)	Fruits white in colour, light hairs on fruit skin, placenta is creamy white and firm
T_2 (24 DAA)	Fruits white in colour, light hairs on fruit skin, smooth and shiny, placenta is creamy white and firm
T_3 (27 DAA)	Fruits white in colour, light hairs on fruit skin, smooth and shiny Placenta turning to light orange and spongy
T_4 (30 DAA)	Fruits white in colour, placenta turning to light orange to red and spongy
T_5 (33 DAA)	Fruits white in colour having light green tinge, no hairs on fruit skin, smooth and shiny; Placenta turning to light orange to red and spongy; seed coat hard
T_6 (36 DAA)	Fruits light green in colour and fruit tip (1/3 portion of the fruit) turns red, no hairs on fruit skin, smooth and shiny; reddish tinted placenta changes from spongy to mucilage and become loose; seed coat hard and detached from placenta
T_7 (39 DAA)	Whole fruits became dark red, no hairs on fruit skin, fruit skin is smooth, placenta dark red, mucilage and loose and seed hard.
T_8 (42 DAA)	Fruit tip starts brusting, no hairs on fruit skin and skin becomes smooth; placenta dark red, mucilage and loose
T_9 (45 DAA)	Whole fruit becomes red, started shrinking and fruit tip burst; placenta dark red, mucilage and loose

placenta changed from spongy to mucilaginous. Thickness of the seed coat increased with increased number of days. On 36 DAA, fruits were light green with red tinged tip and mucilaginous placenta. Seeds were hard and detached from placenta. Morphological characters of seeds studied at various developmental stages showed changes in seed colour and thickness (Table 2). Initially the seeds were ill- filled and creamy white in colour and the ring on the seeds were absent. Later, seed colour changed to light brown, brown and dark brown and the ring became visible.

Table 2: Morphological characters of seeds at different stages of development in snake gourd variety (Baby)

Maturity stage	Morphological characters of seeds in Baby
T_1 (21 DAA)	Unfilled creamy white seeds
T_2 (24 DAA)	Unfilled creamy white seeds
T_3 (27 DAA)	Unfilled creamy white seeds and developed ring on the seed
T_4 (30 DAA)	Seeds not filled completely and light brown in colour, well developed ring on the seed
T_5 (33 DAA)	Seeds filled completely and brown in colour, well developed ring on the seed, seeds loosely attached to the placenta
T_6 (36 DAA)	Seed coat becomes hard and detached from placenta, seeds filled completely and dark brown in colour, well developed ring on the seed
T_7 (39 DAA)	Seed coat becomes hard and detached from placenta, seeds filled completely and dark brown in colour; well developed ring on the seed
T_8 (42 DAA)	Seed coat becomes hard and detached from placenta, seeds filled completely and dark brown in colour, well developed ring on the seed
T_9 (45 DAA)	Seed coat becomes hard and detached from placenta, seeds filled completely and dark brown in colour, well developed ring on the seed

The thickness of the seed coat increased with increased number of days.Fresh weight, length and diameter of fruits were found to increase from anthesis and maximum fruit development was attained by 36 days after anthesis (37.23 cm fruit length with 7.33 cm diameter) and an average fruit weight of 474.83 g (Table 3). Stages of harvesting of fruit had significant influence on seed weight. Upto 30 DAA, the developing seeds could not be separated from placenta and seed coat was not fully developed, whereas by 36 DAA, seed coat was differentiated and the seeds could be separated from placenta. Harvesting of fruits at 36 DAA (T6) recorded significantly higher developed seed weight per fruit. Similar results have been reported by Singh *et al.* (1985) in tomato, Jayabharathi *et al.* (1990) in brinjal, Choudhari *et al.* (1992) in tomato and Naik *et al.* (1996) in capsicum. The growing fruit is an active

Table 3: Fruit and seed characters in snake gourd var. Baby at different stages of harvest

Treatment	Fruit length (cm)	Fruit weight (g)	Fruit diameter (cm)	Seeds per fruit	Fresh weight of seeds (g)	Dry weight of seeds (g)
T_1 (21 DAA)	32.40	351.30	6.66	33.27	8.32	6.64
T_2 (24 DAA)	33.20	375.00	6.68	36.73	9.66	7.79
T_3 (27 DAA)	34.50	409.83	6.86	43.60	11.99	9.81
T_4 (30 DAA)	35.42	434.67	7.09	51.77	14.55	13.08
T_5 (33 DAA)	36.37	448.53	7.12	56.70	16.29	14.75
T_6 (36 DAA)	37.23	474.83	7.33	58.70	17.20	15.90
T_7 (39 DAA)	37.32	472.60	7.30	57.53	16.86	14.97
T_8 (42 DAA)	37.28	461.33	7.22	55.70	16.06	14.06
T_9 (45 DAA)	37.26	456.23	7.22	54.43	15.20	13.61
CD (P=0.05)	0.85	15.44	0.19	2.22	0.60	0.56

sink that diverts and draws water and solutes from other regions of plant. Devdas *et al.* (1994) stated that the central theme of fruit growth seems to be the mobilisation of substances into various tissues. Seeds are completely developed with maximum accumulation of food reserves and completion of biochemical processes in the fruits. It was observed that in snake gourd variety Baby, the maximum fruit weight and seed weight were attained by 36 days after anthesis. Fruits after attaining a maximum growth in the initial stages, its weight decreased towards the later stages. This loss in weight of fruits in later stages was associated with changes in moisture content in maturing fruits (Ganar *et al.*2004).In the present investigation, fresh weight of seeds **(**Table 3) was found to increase as the fruit development advanced reaching maximum at 36 DAA. Similar increase in fresh weight of seeds was recorded by Devdas *et al.* (1994) in ash gourd. The dry weight of developing seeds can be used to assess the maturity of the seeds Krishnakumary*et al.* (2004). From 21 DAA, dry weight of seeds increased irrespective of the variations in fresh weight of fruits and seeds indicating the mobilization and accumulation of photosynthates/ food reserves from fruits to the developing seeds and this is the phase of seed development (Table 3). The seeds reached the germinable maturity by 30 DAA and later the germination increased and reached maximum at 36 DAA in this variety (84%) (Table 4). Relationship between germination and embryo development was explained by many scientists Krishnakumary and Meagle (2011)**;** Ganar *et al.,* (2004).The speed of germination is an important aspect of vigour of any seed lot. The lowest speed of germination was recorded in 30 DAA (2.65) and the highest (9.14) in 36 DAA and thereafter, a decrease in speed of germination was observed (Table 4).

Table 4: Seed quality parameters in snake gourd var. Baby at different stages of harvest

Treatment	Germination per cent	Speed of germination	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Vigour index
T_1 (21 DAA)	0	0	0	0	0	0
T_2 (24 DAA)	0	0	0	0	0	0
T_3 (27 DAA)	0	0	0	0	0	0
T_4 (30 DAA)	30.67	2.65	4.75	9.00	13.75	422.0
T_5 (33 DAA)	60.00	6.59	5.48	10.17	15.65	939.0
T_6 (36 DAA)	84.00	9.14	6.80	16.77	23.57	1980.0
T_7 (39 DAA)	81.33	8.89	6.73	16.65	23.38	1901.0
T_8 (42 DAA)	78.67	8.67	6.82	15.95	22.77	1791.0
T_9 (45 DAA)	74.67	8.42	6.47	15.13	21.60	1613.0
CD (P=0.05)	4.92	0.44	0.32	0.40	0.47	99.0

The relative root length and shoot length of the seedling would predict their subsequent growth and performance and hence could be regarded as indices of measurement of seed vigourKrishnakumary and Meagle (2011). The root and shoot length of seedlings was the lowest in 30 DAA (4.75 cm and 9.00 cm respectively) and it increased reaching the highest in 36 DAA (6.80 cm and 16.77 cm). Fully matured seeds have the advantage of complete physical and physiological development needed for

maximum expression of vigour. In the present study, seed quality parameters (Table 4) such as, speed of germination (9.14), root length (6.80 cm), shoot length (16.77 cm), seedling length (23.57 cm) and seedling vigour index (1980.0) were significantly higher in the seeds harvested from fruits at 36 DAA and hence it could be concluded that this is the right stage for fruit harvest for getting maximum seed quality attributes. These results are in agreement with the findings of Singh and Sidhu (1985) in brinjal and Nandeesh *et al.* (1995) in cucumber where relationship between seed maturity and seed quality parameters were observed.

It may be concluded that fruits attained maximum weight and length when harvested at 36 days after anthesis. Seed quality parameters viz., seeds per fruit, fresh and dry weight of seeds, 100 seed weight, germination percent, speed of germination, seedling length and vigour index were maximum in fruits harvested at 36 days after anthesis. Morphological characters of the fruit at this stage included change in fruit colour turning red at the tip portion and the placenta colour changing to red. Seeds got detached from the mucilaginous placenta and seed coat became hard with well-developed ring on the seed surface.

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