

Studies on propagation of aonla under Paschimanchal condition of West Bengal.

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Abstract

A study was carried out in a private orchard in Paschim Midnapore district of West Bengal during the period 2006-2008 to find out the best time for propagation of aonla in nursery and field. Another investigation was also made to find out the compatibility of seven cultivars of aonla to wedge grafting in nursery, using rootstock of 'local' cultivar. Results indicated that wedge grafting to be the best in nursery propagation as it gave higher success (60 to 70 per cent) for a longer period (45th August to 25th September) as compare to budding. The growth of the plant was better when operation was performed in early part of monsoon (*i.e.*, June) in both the cases of budding and grafting. *In-situ* propagation of aonla considered to be the best way for raising orchard as compare to nursery propagation as it resulted highest success (80%) with better plant growth and suitable time was the last week of June and first week of August. Regarding compatibility of the cultivars to wedge grafting with local cultivar, NA-10 found to show best result by giving 70% success followed by BSR-1, Chakaiya and Neelum (50% success). Growth of the grafted plants was good in most of the cultivars.

Key words: Aonla, budding, wedge grafting, nursery, field, Paschimanchal.

Introduction

For versatile use with nutritive and high medicinal values, cultivation of aonla has been gaining popularity mainly in marginal and waste lands where other crops even many fruit crops are difficult to grow. It is well known that varietal specification is the foremost task for commercialization of any crop for a locality. In aonla a number of varieties have been recommended for various agro-climatic zones of India (Ghosh *et al.*, 2003; Chezhiyan and Shanmugasundaram, 2003; Singh *et al.*, 2003). It is experienced that availability of sufficient number of good planting materials of recommended cultivars is one of the major problem in fruit cultivation and it is quite true for West Bengal. For production of sufficient planting materials or raising of aonla orchard in degraded soil, best time and method of propagation should be known for commercial multiplication of the crop as it is varied from region to region (Patil, 2004; Tewari *et al.*, 2005; Panchbhai *et al.*, 2006). Incompatibility in grafting is now considered to be one of the common problems for

poor success in many fruit crops (Ghosh and Tarai, 2005; Shirol *et al.*, 2005) and very less report on graft-compatibility of various aonla cultivars is available. With the view to above discussed problem, an propagation investigation was undertaken to standardize the propagation package of aonla for Paschimanchal of West Bengal. The Paschimanchal of West Bengal include the districts of Paschim Midnapore, Bankura, Purulia, Birbhum and part of Burdwan where the soil is red and laterite and receive low precipitation.

Materials and methods

The experiment was conducted in a nursery of private farm at Jhargram in Paschim Midnapore district of West Bengal during the monsoon period of 2006 and 2008. The soil in the area of study was laterite and climate is dry, sub-tropical in nature. Meteorological data during the course of study has been presented in Table 1. To standardize the season for commercial multiplication of aonla in nursery, the seedlings of local rootstock were raised in perforated black polythene packets (25 cm x 15 cm). Budding and grafting operation was carried out on one year old rootstock seedlings, using 'NA-10' scion. The operation was carried out on 10 and 25th dates of each

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month of June to October of 2006 and 2007. In each time 50 seedlings were used in each case which were replicated three time in a randomized block design. The budding was done under open sunlight condition as it was found to be the best as compare to full or partial shed condition. In case of grafting, the grafted plants were kept under full shade for 21 days after operation and then shifted to open sunlight. The ploy-cap (pepsi cap) was used to cover the grafted scion for increasing humidity around the graft-union. The ploy-cap was removed, when scion sprouted well, which generally took 8-15 days. Success and plant growth in budding and grafting were recorded 3 months after operation.

To know the best time of *in-situ* propagation in field, budding was done on one year old rootstock seedlings of local cultivar, grown in open field condition at a spacing of 60 cm x 60 cm. The operation was carried out on 10th and 25th dates of each month of June to October of 2006 and 2007. Fifty seedlings of *in-situ* grown was patch budded with scions of NA-10 cultivar of aonla which were replicated three time in a randomized block design. Budding success and budling growth was recorded, three month after operation.

To know the varietal response to wedge grafting, scions of seven cultivars viz., Anand-1, BSR-1, Chakaiya, Kanchan, Krishna, NA-10 and Neelum were grafted on rootstocks of local cultivar of 12 month old on 25th August of 2007 and 2008 under nursery condition. The data on grafting success and plant growth was taken in both the years and average data has been presented in the paper.

Results and discussion

To get maximum success with better plant growth, information on exact time and method of propagation of aonla grown in poly packets is paramount importance for successful nursery business in a locality. The results presented in Table 2, clearly indicated that grafting gave higher success as compare to budding irrespective of time of operation except on 10th June and 10th August. Patil

(2004) from Maharashtra also found wedge grafting was better as compared to budding in aonla and the operation time, mid August was the best followed by July. However, Tewari *et al.* (2005) from Jhansi (Uttar Pradesh) reported that bench grafting with softwood cleft grafting during February would be the best as it gave 85% success in seedlings, grown in poly packets in nursery. It was noted that 25th August was the best time for nursery propagation in aonla under present situation as highest success was noted both in budding (60%) and grafting (70%) at that time. Higher propagation success during the period of 25th August to 10th September was due to better physiological condition of scion and rootstock and congenial atmospheric condition. Singh *et al.* (2003) also observed highest success in patch budding when performed during last week of August under Hisar (Haryana) condition. But under Faizabad (Uttar Pradesh) condition last week of June reported to be the best (Srivastava *et al.*, 2002). It is cleared from the discussion that method and time of operation for getting maximum success is varied from place to place. It was further noted that success was low during the period 10th July to 10th August both in budding and grafting.

The growth of successful plants in respect of height and leaf number was more in grafted plants as compared to budding irrespective of time of operation (Table 2). The growth of the plant was maximum when operation was made in June (10th and 25th) followed by 25th August in both the cases of budding and grafting and this may be due to higher atmospheric temperature, that caused more cell division and enlargement at faster rate.

In West Bengal, aonla has been cultivated mainly in red and laterite zone (Paschimanchal) where the soil is porous, low water holding capacity and the zone receives low precipitation. Raising of orchard in such adverse situation, with poly packet grown seedlings, may result poor field establishment due to damage of tap root system. *In-situ* raising of orchard in such peculiar situation is to be real solution. The data of two years of investigation showed an encouraging result (Table 2). Highest success (80%)

Table 1. Meteorological data at the experimental site during the period of investigation (Average of 2006 and 2007).

Time	Rainfall (mm)	No. of rainy days	Temperature (°C)		Humidity (%)	
			Maximum	Minimum	7.00 am	2.00 pm
1 st June to 15 th June	126.0	9	40.5	24.6	92.0	67.0
16 th June to 30 th June	498.0	12	34.9	24.7	89.0	79.7
1 st July to 15 th July	76.6	9	34.8	25.8	88.7	74.7
16 th July to 31 st July	55.0	8	34.8	25.8	89.0	76.0
1 st August to 15 th August	157.1	11	36.1	26.1	93.0	80.3
16 th August to 31 st August	129.9	10	35.8	25.3	93.7	79.3
1 st Sept. to 15 th September	84.1	8	35.7	25.2	90.0	75.3
16 th Sept. to 30 th September	167.0	8	35.7	24.6	89.4	75.3
1 st October to 15 th October	50.8	4	35.9	23.6	89.3	60.0
16 th October to 31 st October	0.0	0	35.8	20.8	86.0	53.3

Table 2. Effect of season on success of budding and grafting of aonla cv. NA-10 in nursery and field.

Time of operation	Propagation in nursery seedlings, raised in polybags*						Propagation in field (<i>In-situ</i>) by budding*		
	Budding			Grafting			budding*		
	Success (%)	Height (cm)	Leaf number	Success (%)	Height (cm)	Leaf number	Success (%)	Height (cm)	Leaf number
10 th June	40 (39.23)	20	30	30 (33.21)	24	40	40 (39.23)	27	33
25 th June	20 (26.57)	15	20	45 (42.13)	30	60	80 (63.43)	32	38
10 th July	10 (18.43)	1	5	20 (26.57)	20	30	40 (39.23)	17	18
25 th July	0 (0.0)	-	-	10 (18.43)	10	12	60 (50.77)	15	20
10 th Aug.	25 (30.00)	2	6	10 (18.43)	12	14	80 (63.43)	33	35
25 th Aug.	60 (50.77)	11	18	70 (56.79)	22	22	20 (26.57)	4	13
10 th Sept.	40 (39.23)	4	8	65 (53.73)	20	22	0 (0.00)	-	-
25 th Sept.	20 (26.57)	1	3	60 (50.77)	10	16	0 (0.00)	-	-
10 th Oct.	0 (0.00)	-	-	40 (39.20)	2	8	0 (0.00)	-	-
C.D. at 5%	6.60	3.5	3.1	4.30	4.8	8.0	7.80	3.2	5.1

* Average of two years. Figures in the brackets are angular transformed values.

Table 3. Response of different cultivars of aonla to wedge grafting.

Cultivars	Success (%)	Plant growth – 3 months after grafting	
		Height (cm)	Leaf number
Anand-I	10 (18.43)	20.0	21.5
BSR-I	50 (45.00)	35.2	26.2
Chakaiya	50 (45.00)	19.0	15.2
Kanchan	15 (22.79)	23.0	11.3
Krishna	35 (36.27)	15.2	11.8
NA-10	70 (56.79)	24.2	23.2
Neelum	50 (45.00)	18.3	17.2
C.D. at 5%	4.8	0.8	2.6

Figures in the brackets are angular transformed values.

with maximum plant growth was achieved in *in-situ* when budding was done on 25th June and 10th August followed by 25th July (60%). It was very interesting to note that budding during 25th June to 10th August, which resulted low success in poly packet grown seedlings, gave higher percentage of success in *in-situ* grown seedlings in field. This reason may be explained from the fact that *in-situ* grown seedlings have good tap root system that help to supply better nutrients and moisture to the stock plant and thereby improve physiological condition of the plants. Better physiological status of stock plant of *in-situ* grown seedlings, would result better cambium activity and help to show good success after budding. Dixit *et al.* (1996) from Gujarat also observe higher success with better plant growth in *in-situ* patch budded plants as compared to pot-grown seedlings at the same time of operation. *In-situ* raising of aonla orchard through patch method of budding in second week of September has also been advocated by Kumari *et al.* (2004) for area extension in Haryana.

The results of response of aonla cultivars to wedge grafting on rootstocks of local cultivar have been presented in Table 3. Maximum budding success of 70% was noted in NA-10 followed by 50 per cent in BSR-I, Chakaiya and Neelum. Lowest success (10%) was observed in Anand-I followed by Kanchan (15%). Good budding success in cultivars like NA-10, BSR-I, Chakaiya and Neelum may be due to cambium continuity which is always observed in compatible graft unions (Ermel *et al.*, 1995). Shete *et al.* (1999) also noted differential budding success of aonla cultivars on local rootstock under Rahuri (Maharashtra) condition. Highest plant height (35.2 cm) and maximum leaf number (26.2) was recorded from cultivar BSR-I followed by NA-10 having height of 24 cm and leaf number of 23.2, recorded three months after budding. Highest plant growth in BSR-I may be due to higher activity of meristematic tissues which is seemed to be inherent nature of the cultivar concerned.

References

- Chezhiyan, N. and Shanmugasundaram, K. A. 2003. BSR-1 - a high yielding, self-fruitful aonla variety from Tamil Nadu. *Journal of Applied Horticulture - Lucknow*, 5(2) : 108-109.
- Dixit, C. K., Kikani, K. P., Patel, R. B. and Parmar, B. V. 1996. Comparative study of *in-situ* and potted plant patch budding in aonla cv. Gujarat Amla-1. *J. Applied Hort. - Navsari*, 2 : 122-126.
- Ermel, F. F., Catesson, A. M. and Poessel, J. L. 1995. Early histological diagnosis of apricot/peach x almond grafts incompatibility. Statistical analysis of data from 5 months-old grafts. *Acta Hort.*, 497-530.
- Ghosh, S. N. and Tarai, R. K. 2005. Effect of two rootstock species on success of grafting in nine types of custard apple. *South Indian Horticulture*, 53(1-6) : 221-223.
- Ghosh, S. N., Mathew, B. and Manna, S. 2003. Evaluation of some aonla cultivars in West Bengal. *Journal of Interacademia*, 7(1) : 21-24.
- Kumari, A., Bhatia, S. K. and Joon, M. S. 2004. Standardization of *in-situ* patch budding time in aonla. *Haryana J. Hort. Sci.* 33 : 234-235.
- Panchbhavi, D. M., Athavale, R. B., Jogdande, N. D. and Dalal, S. R. 2006. Soft-wood grafting - aonla propagation made easy. *Agricultural Science Digest*, 26(1) : 71-72.
- Patil, K. B. 2004. Vegetative propagation techniques in aonla. *Journal of Soil and Crops*, 14(1) : 194-195.
- Shete, M. B., Pawar, B. G., Karale, A. R. and Kaulgud, S. N. 1999. Varietal response of aonla for patch budding. *J. Maharashtra Agric. Universities*, 24 : 210.
- Shirol, A. M., Kanamadi, V. C. and Thammaiah, N. 2005. Response of different sapota cultivars to softwood wedge grafting. *The Karnataka J. Hort.* 1 : 41-43.
- Singh, B. K., Sharma, S., Niwas, R. and Kumar, S. 2003. Effect of methods and time of budding on bud sprouting in aonla cv. Chakaiya. *Haryana J. Hort. Sci.* 32 : 27-28.
- Singh, Virendra, Kumar, Surendra and Singh Prabhakar. 2003. Physico-chemical analysis of different aonla cultivars a maturity stage under Chhattisgarh region. *Journal of Eco-physiology*, 6(3/4) : 141-143.
- Srivastava, A. L., Singh, H. K. and Singh, I. S. 2002. Studies on propagation of aonla. *Haryana J. Hort. Sci.* 31 : 156-158.
- Tewari, R. K., Bajpai, C. K. and Dwivedi, R. P. 2005. Bench grafting in aonla. *Indian Journal of Agricultural Sciences*, 75(5) : 296-297.