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Studies on the effect of methods and dates of budding in aonla

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Abstract
The field trial comprising patch, "T" and modified ring budding and four dates of budding, i.e. 15th June, 15 July, 15 August and 15 September was conducted to find out the proper method and ideal date of budding for the multiplication of aonla plants. Patch budding was found to be the best method and was followed by modified ring. The operation should be performed on four month old seedlings in June- July for obtaining better success and healthier aonla grafts.

Keywords: anola (*Emblica officinalis* Gaertn), method of budding, date of budding

Introduction
Aonla (*Emblica officinalis* Gaertn) is indigenous to India and thrives well throughout the tropical and subtropical climate of the country (Firminger, l). the cultivation of aonla is extending in western (U.P., M.P. Rajasthan etc. Aonla has wide adaptability, high nutritive value. immense industrial importance and more profit on marginal and sodic soils as compared to other fruit crops. There is a lot of demand of genuine plant material for commercial plantation. Recently, a few good varieties have Recently been developed but the graft of these varieties are not available to the grower in sufficient number. Multiplication of aonla by inarching is expensive and time consuming (Singh. 9). Inarching produces weak plants (Srivastava, ll and Singh, 10). Old rootstock for budding is time taking and makes the proposition costlier. The methods and dates of budding for this crop have not been standardized for Agra tract which falls in semi-arid part of the country.

Materials and Methods
Trial was conducted during 1995 and 1996 with a view to find out the ideal date and best technique of budding at R.B.S. College, Bichpuri (Agra). The plant material consisted of about 4 months old uniform seedling plants grown at the college farm. To promote germination the seed were kept moist for 5-6 days in gunny bag prior to each sowing which was done on 15th day of February, March, April and May to be budded in June, July, August and September respectively. 45 days old healthy seedling were transplanted at 30 x 30 cm in the nursery bed which was fertilized with FYM, Nitrogen Phosphorus and Potassium @ 200q. 200kg, 80kg and 80 kg per ha respectively. Seedlings were also sprayed twice with 0.5% and 1.0% tresol at 60 and 90 days after sowing respectively in order to induce vigorous growth. Three methods of budding, namely, patch, 'T" and modified ring and four dates of budding, i.e. 15th day of June, July August and September were tried in all possible combination in randomised block design with three replication, Twenty seedling formed a net plot. Vigorous pencil thick scion shoots were procured from 12-15 year old trees of aonla cv. Balwant bold from the college orchard.

Results and Discussion
Sprouting of scion-bud
Time and method of budding exhibited significant variation in the percentage of scion bud sprouted. The maximum sprouting and bud-take at 32 DAB was recorded in patch budding followed by modified ring and "T" budding. The former methods of budding also took minimum days for sprouting of 1st scion bud as compared to "T" budding (Table l). Similar results were reported Moti *et al.* [5] and Pathak *et al.* [7].
The maximum percentage of scion bud sprouted and bud-take at 32 DAB was recorded from July budding and was closely followed by June and August and September budding. These variations were significant.

However, the duration taken for the sprouting of 1st scion-bud was lowest in July budding and was delayed significantly with each date of budding,

It may be noted that patch budding done in June gave the maximum sprouting while such response of modified ring budding was recorded in July budding (Table. l), Results are in agreement With Pathak *et al*. [7] Morton *et al*. [4], advocated that weather played an important role in bud union and sprouting of scion bud in aonla and custard apple.

Growth of graft

Length and diameter of scion shoot, number of determinate shoot and leaves per graft at 10 WAB were affected significantly by the methods of budding. The values for above growth parameter were recorded maximum under patch budding which was followed by modified ring and shield "T" budding. Similar impact of patch and shield "T" budding were also recorded by Singh and Srivastava [8] in guava.

The plants budded in July produced longer scion shoot with thicker diameter above the union and also produced more number of determinate shoot and leaves per graft al 32 DAB as compared to June budding. These growth parameters were adversely affected due to further delay in budding beyond July (Table 2). The influence of date of budding on the diameter of rootstock below the union at 32 DAB also followed the same patter n of growth. Heartmann and Kester [2], Morton *et al*. [4] and Kauandal *et al*. [3] opined that the budding success was correlated with temperature and relative humidity during and following the period of budding.

The effect of interaction between date and method of budding on the growth parameters of graft was more pronounced and significant. Patch budding done in June and July was superior and followed by modified ring budding done in the same duration Pandey and Prasad [6] and Pathak *et al*. [7], also suggested patch budding in June and July for better success in aonla.

Table 1: Effect of date of budding in aonla under field condition

Character studied	Method of budding	Date of budding							
		1995				1996			
		June 15	July 15	Aug. 15	Sep. 15	June 15	July 15	Aug. 15	Sep. 15
Days taken for sprouting of 1st bud	MI	11.67	16.33	18.00	21.67	11.00	16.00	17.00	21.33
	M2	11.67	21.00	21.67	24.00	11.67	20.00	20.67	23.33
	M3	12.00	17.00	18.33	22.67	11.33	17.00	17.33	22.33
Bud-take at 3.2 DAB	M1	80.00	80.00	63.33	88.33	85.00	83.33	68.33	96.67
	M2	55.00	61.67	63.33	78.33	58.33	65.00	70.00	76.67
	M3	76.67	81.67	61.67	90.00	81.67	80.00	71.67	95.00
Scion-bud sprouted (%)	M1	80.00	76.67	65.00	58.33	83.33	80.00	63.33	60.00
	M2	51.67	61.67	51.67	50.00	55.00	61.67	53.33	48.33
	M3	76.67	80.00	53.33	56.67	80.00	80.00	58.33	58.33
Scion-bud sprouted but the scion shoot died. (%)	MI	0.00	6.69	7.54	10.07	1.96	10.19	9.89	16.28
	M2	0.00	8.67	10.07	14.44	2.78	10.90	12.42•	13.70
	M3.	0.00	8.63	16.30	17.78	2.08	10.69	22.98•	17.17

Where

M_1: Patch budding. M_2: "T" budding, M_3: Modified ring budding; DAB: Days after budding

Table 2: Effect of date of budding and method of building in anola

Character studied	Method of budding	Date of budding							
		1995				1996			
		June 15	July 15	Aug. 15	Sep. 15	June 15	July 15	Aug. 15	Sep. 15
Length of sprout at 10 WAB (Cm)	M1	66.73	70.00	44.00	32.57	64.83	68.07	42.03	30.67
	M2	53.27	55.83	32.57	22.20	52.47	54.93	31.67	24.43
	M3	60.40	63.42	39.30	29.43	58.50	61.50	37.40	27.53
Diameter of scion shoot (mm) above union at 10 WAB	M1	6.80	8.20	4.53	3.80	7.00	6.90	4.73	4.00
	M2	5.60	6.00	4.30	3.40	5.80	6.20	4.50	3.43
	M3	6.30	7.20	4.60	3.60	6.53	7.40	4.80	3.80
Number of determinate shoot/graft at 10 WAB	M_1	60.90	64.60	39.03	28.67	64.94	66.62	41.22	30.42
	M_2	47.50	50.00	26.67	17.10	49.52	52.22	28.65	19.21
	M_3	56.50	58.33	34.43	24.93	58.42	57.01	36.22	26.86
Number of leaves per graft at 10 WAB	M_1	36 54.0	3876.0	2342.0	1720.0	3774.0	3996.0	2464.0	1840.0
	M_2	2850.0	3000.0	1600.0	1026.0	2970.0	3120.0	1720.0	1079.0
	M_3	3520.7	3500.0	2066.0	1496.0	3510.0	3620.0	2186.0	1616.0
Diameter of rootstock (mm) just below union at 10 WAB	M_1	10.65	11.39	12.45	12.43	10.96	11.59	12.65	12.54
	M_2	9.55	9.59	11.79	11.83	9.69	9.77	11.78	11.94
	M_3	10.05	10.29	12.36	12.00	10.56	10.49	12.44	12.33
Diameter of rootstock (mm) just above union at 10 WAB	M_1	9.97	11.69	13.62	11.43	9.93	11.49	11.85	11.63
	M_2	9.45	9.49	11.49	11.00	9.64	9.09	11.59	11.20
	M_3	9.75	9.69	11.86	11.30	9.85	10.39	11.75	11.50

Whare:

M_1: Patch budding, M_2: "T" budding, M_3: Modified ring budding; WAB: Weeks after budding

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