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Role of Time of Budding for Success in Sweet Orange (*Citrus sinensis* Osbeck) and Mandarin *Citrus reticulata* Blanco)

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ABSTRACT

The budding was carried out on Karna Khatta rootstock with mandarin and sweet orange scion at monthly interval throughout the year. The months of September and February were found to be the best for budding of sweet orange and mandarin under Udaipur conditions. It was observed that the success in budding depended on the "vapour pressure deficit" of the atmosphere and the occurrence of extremes of temperature after the budding operation. The budded plants are generally planted out of nursery with the beginning of monsoon, i.e., from July. The plants raised by budding in the month of March do not become worth planting by coming July, i.e. in four months period, and hence they have to be kept in the nursery for a period of sixteen months, i.e. till next July. However, if the budding is done in October, the plants get nine months old by coming July and, therefore, are ready for plantation. This reduces the nursery care of plants by seven months resulting in economical multiplication of plants.

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INTRODUCTION

Oranges are important fruit crops both nutritionally as well as economically. Although the area under these crops in Rajasthan is much less but tremendous expansion possibilities exist and, therefore, there is a great demand for reliable budded plants to keep pace with planting.

Khan (1957) reported August and Said and Inayatullah (1965) reported March and early August to be the best times for budding sweet oranges in Pakistan. In Saharanpur (U.P.), Singh (1957) reported that June was better than the usual September-October and tMarch-April periods. In Rajasthan, budding in citrus is generally done during February-March. No work has been reported regarding the feasibility of this operation in other months of the year. This study was, therefore, taken up at the Agricultural Experiment Station, University of Udaipur, Udaipur, Ra-

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jasthan, to evaluate the various months of the year with respect to the success in budding in mosambi and Nagpuri santra, so that faster multiplication of budded plants can be possible by extending the scope of budding in other months also.

MATERIAL AND METHODS

Seedlings of Karna (*Citrus karna* Macf.) about one year in age, uniform in growth and thickness were used as rootstock for budding. Seedlings were spaced 75 cm apart in the nursery and were given similar cultural treatments. The budding was performed on the first day of every month from March 1917 to February 1972. These represented the twelve treatments. The budding height was kept 45 cm from the ground level. Alkathene rape was used for typing. I-budding (a form of shield budding in which horizontal cut is omitted) was adopted. Sixty seedlings for budding with sweet orange (Cv. Mosambi) and sixty for budding with mandarin (Cv. Nagpuri santra) were used. Round bud sticks from current year growth having dormant buds were used as the scion material. The shoots emerging from the stock before and after budding were removed periodically. Immediately after budding, the

TABLE 1

Effect of time of budding on per cent bud take, bud sprout and survival of mandarin and sweet orange.

	Bud take %		*Bud sprout* %		*Bud survival* %	
Months	*Mandarin*	*Sweet orange*	*Mandarin*	*Sewet orange*	*Mandarin*	*Sweet orange*
Feb.	71.25	61.68	64.51	57.62	58.92	56.76
March	55.33	53.86	47.37	46.46	46.29	43.23
April	47.48	41.04	36.62	34.17	34.89	30.80
May	67.77	52.88	45.17	40.65	46.29	36.00
June	57.02	51.77	47.64	44.64	48.59	40.90
July	43.15	40.88	40.18	35.06	42.86	38.14
Aug.	44.80	44.81	39.81	33.44	36.99	35.13
Sept.	63.96	64.65	58.72	55.14	60.54	54.70
Octo.	45.53	38.39	36.11	33.35	33.94	28.46
Nove.	23.65	18.04	19.30	16.61	00.00	00.00
Dece.	46.65	56.99	41.28	39.66	37.51	35.56
Jan.	73.25	65.38	54.81	53.19	53.90	48.35
S.Em		1.165		1.395		0.823
C.D. at 5%		3.286		3.935		2.320
C. V. %		4.55		6.55		4.16

rootstock was clipped a little above the site of budding. The bud take was recorded 15 days after budding, the sprouting percentage after one month and the survival percentage was recorded when the plants attained a height of about 30 cm. The observations were made daily on the maximum and minimum temperature and relative humidity (R.H.) throughout the year. On the basis of daily mean temperature and R.H., vapour pressure deficit (v.p.d.) was computed.

RESULTS AND DISCUSSION

The differences in per cent bud take between various months were statistically significant (Table 1). The per cent bud take in mandarin was 73.25 per cent by budding in the month of January 71.25 in February and 63.96 per cent during September. In sweet orange also the per cent bud taken was 68.38 by budding in January, 64.65 per cent in September and 61.68 in February. By budding in the months of November and July the lowest percentage of bud take was recorded. Said and Inayatullah (1965) have reported that March and early August were the best times for obtaining a good average bud take in sweet orange in Pakistan.

There were significant differences in sprouting percentage of buds in both mandarin and sweet orange among various budding months. In mandarin, the sprouting percentage was 64.51 from February budding and 54.70 from September budding. In sweet orange the sprouting was 57.62% by budding in February and 55.14% in September. Sprouting percentage was very poor by budding in November both in mandarin and sweet orange i.e. 19.30 and 16.61 per cent respectively. The survival percentage in mandarin was 60.54 during the month of September and 58.92 during February (Table 1). Similarly in sweet orange survival percentage was maximum i.e. 56.76 in the month of February and 54.70 in September. All the buds died when budded in November.

It is, therefore, clear that the months of February and September emerge out to be the best with respect to bud take, bud sprouting and the survival percentage in both mandarin and sweet orange, however, budding in January also gave satisfactory results. Following the Fig. 1, it becomes quite clear that the success or failure in budding seems to be dependent on vapour pressure deficit (v.p.d.) of the atmosphere and the occurrence of extremes of temperature, particularly the lower extreme, rather than the relative humidity and the mean daily temperature. A high v.p.d. indicates high evaporative power of air and which should cause dehydration of the matrix as well as the bud. Occurrence of an extremely low temperature would probably reduce the cambial activity. Such conditions therefore, result in poor success. It can be seen that as the v.p.d. rose from March to April and May, the percentage survival dropped. Later, as the v.p.d. dropped, the percentage survival increased. A higher extreme of temperature in April and May might have added to the effect of high v.p.d. in reducing the success in budding during these months. However, the percentage survival was very low in

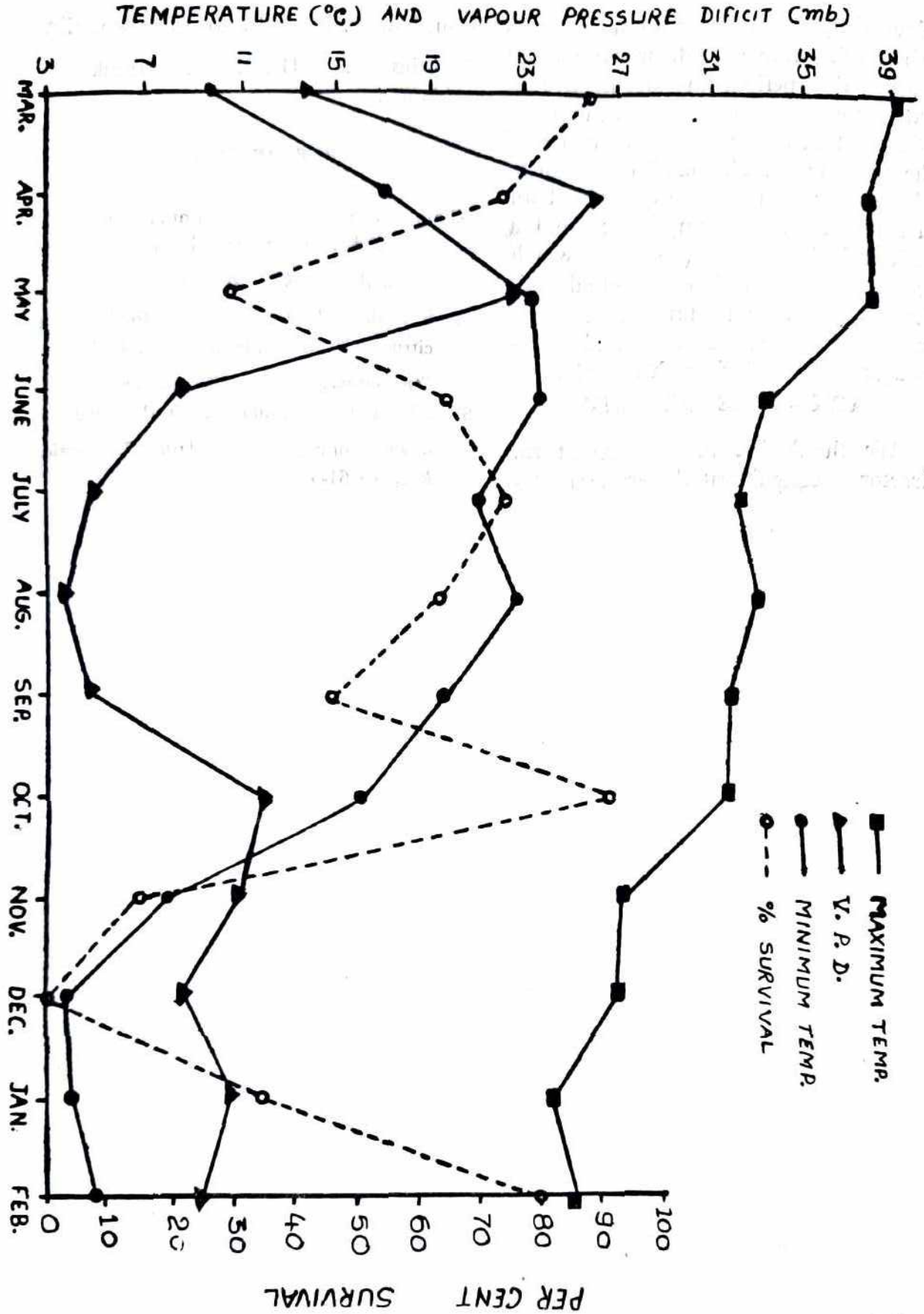

Fig. Per cent bud survival (average of sweet orange and mandarin) in relation to vapour pressure deficit, minimum and maximum temperature.

November, December and January even when a favourable v.p.d. prevailed. But during this period, the occurrence of extremely low temperature of the order of 3-5° C was very likely the cause of the poor success. The buddings performed February onwards experienced an increase in the air temperature and a sufficiently low v.p.d. (14 mb) which probably caused maximum cambial activity and minimum desiccation. This probably resulted in increased percentage success during this period.

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