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METHODS AND TIME OF BUDDING FOR PEACH NURSERY TREES

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Abstract: The relative success of T-budding, with and without "backwood", and of chip budding were compared at four different times for the production of peach nursery trees. Early budding resulted in the highest bud takes. There was no significant difference in success among the three methods. Budding was unsuccessful for the last budding time, regardless of whether chip budding or T-budding was used.

INTRODUCTION

In cool temperate areas the period available for T-budding peaches is restricted by the time taken for the seedling to attain sufficient girth and the limited period in which the bark will lift to allow bud insertion.

Extension of the budding season is potentially possible by the use of chip budding where there is no requirement for the bark to slip. Howard (4) suggests that a major advantage of chip budding over T-budding occurs where the post-budding period for cambial activity is limited (e.g. in England). An extension of the budding season for apples by use of chip budding is reported by Howard (4) but best results were attained during the period normally associated with conventional T-budding. Successful employment of chip-budding in *Prunus* is reported by Bremer (1) for peach and cherry, and Poniedzialek (5) for sour cherry.

In New Zealand T-budding is the predominate method used for propagation of peach. T-budding is a well established technique but there remains some debate as to the relative merits of whether to remove the slip of wood remaining behind the bud prior to insertion in the stock.

The objective of the trial described here was to investigate the relationship between time and method of budding. T-budding, both with and without the backwood, was compared with chip-budding.

MATERIALS AND METHODS

This trial was located in Canterbury, New Zealand, a region with a cool, dry climate. During the budding period daily temperature maximums range between 14° and 32°C and daily minimums between 2° and 18°C. This region is also subject to considerable variation in wind intensity and direction which influence temperature and humidity.

The rootstocks were *Prunus persica* 'Golden Queen' seedlings which had been direct sown the previous June (early winter). The trial was conducted within a large block of seedlings grown for commercial propagation and hence were subject to commercial management practice as reported by the authors (2).

In early February (late summer) stocks for the experiment were identified for all budding times and were selected for uniformity of girth (approximately 6 mm diameter).

Experimental design was a randomised complete block with four replicates of each of the twelve treatments. Each replicate contained twenty stocks.

Scionwood of *Prunus persica* 'Red Haven' was obtained from an adjacent orchard block on the day of budding. Four budding times were selected at three weekly intervals commencing 8 February. These dates were adjusted by one or two days if weather conditions were not considered suitable for budding.

Three budding techniques were employed: (a) Chip-budding, (b) T-budding with wood retained, and (c) T-budding with wood removed. Plastic budding ties were used. For the first two budding times the ties were removed four weeks following budding to avoid girdling resulting from trunk expansion in the stock. This was not a problem for the later times and ties were retained until leaf fall in early June.

During the dormant period the stocks were headed back to 150 mm above the bud. Budding success was evaluated on 25 September, at which time shoot growth on successful buds was about 25 mm.

RESULTS

Figure 1 shows the relative success of budding methods and the decline in bud take for the last two times. Soil and air temperatures are given in Figure 2 and indicate declining temperatures as the season progressed.

No significant difference in bud take was measured among the three budding techniques at any of the first three budding times (Table 1). T-budding at the fourth budding time was prohibited by the failure of the bark to slip. Chip budding at this time was a failure with almost zero success even though it is a method normally used when bark-lift is poor.

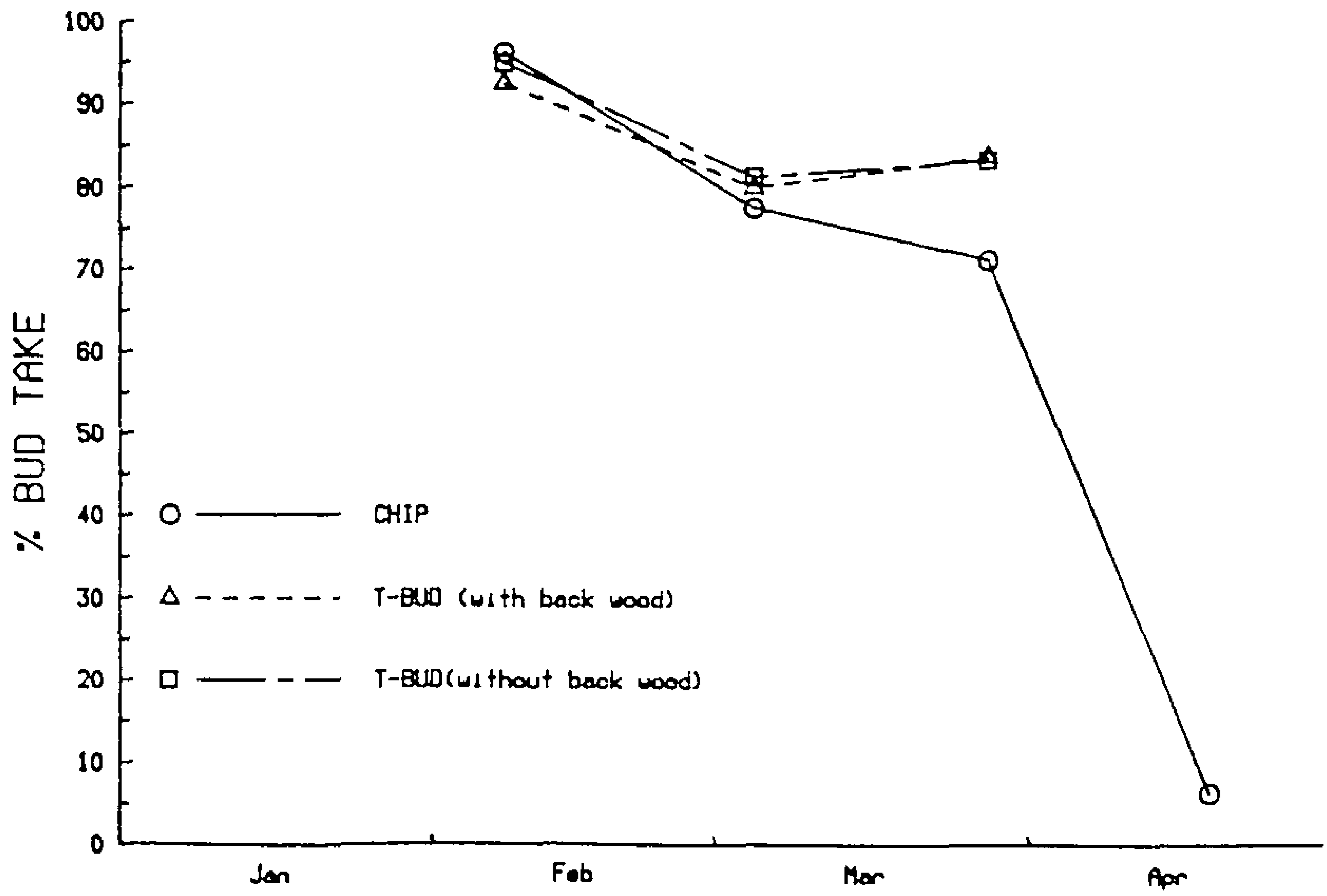

Figure 1. Relative success of the three budding methods. Note the decline in bud takes for the last two times.

Table 1. The effect of budding time and method on percentage bud take in peaches.

Date	Bud Take			Mean of Time
	Chip-bud	T-bud (with)[1]	T-bud (without)	
8 February	96.3%	92.5%	95.0%	94.6%
5 March	77.5	80.0	81.3	79.6
28 March	71.2	83.8	83.4	79.4
19 April	(6.3)	(—)	(—)	
Mean of Method	81.7	85.4	86.5	
LSD (5%) = 16.9				
Date (linear):	P = 0.004 (**)			
Between Methods:	not significant			
Interactions:	not significant			

[1] Woodpiece behind bud.

DISCUSSION

It is apparent that under Canterbury, New Zealand conditions there is considerable advantage in budding as early as possible. The observed decline in successful bud acceptance from early February (late summer) is probably a consequence of a slowing in physiological activity in the rootstock, particularly with regard to cambial activity and also to the steady decline in temperature both in the air and soil (Figure 2).

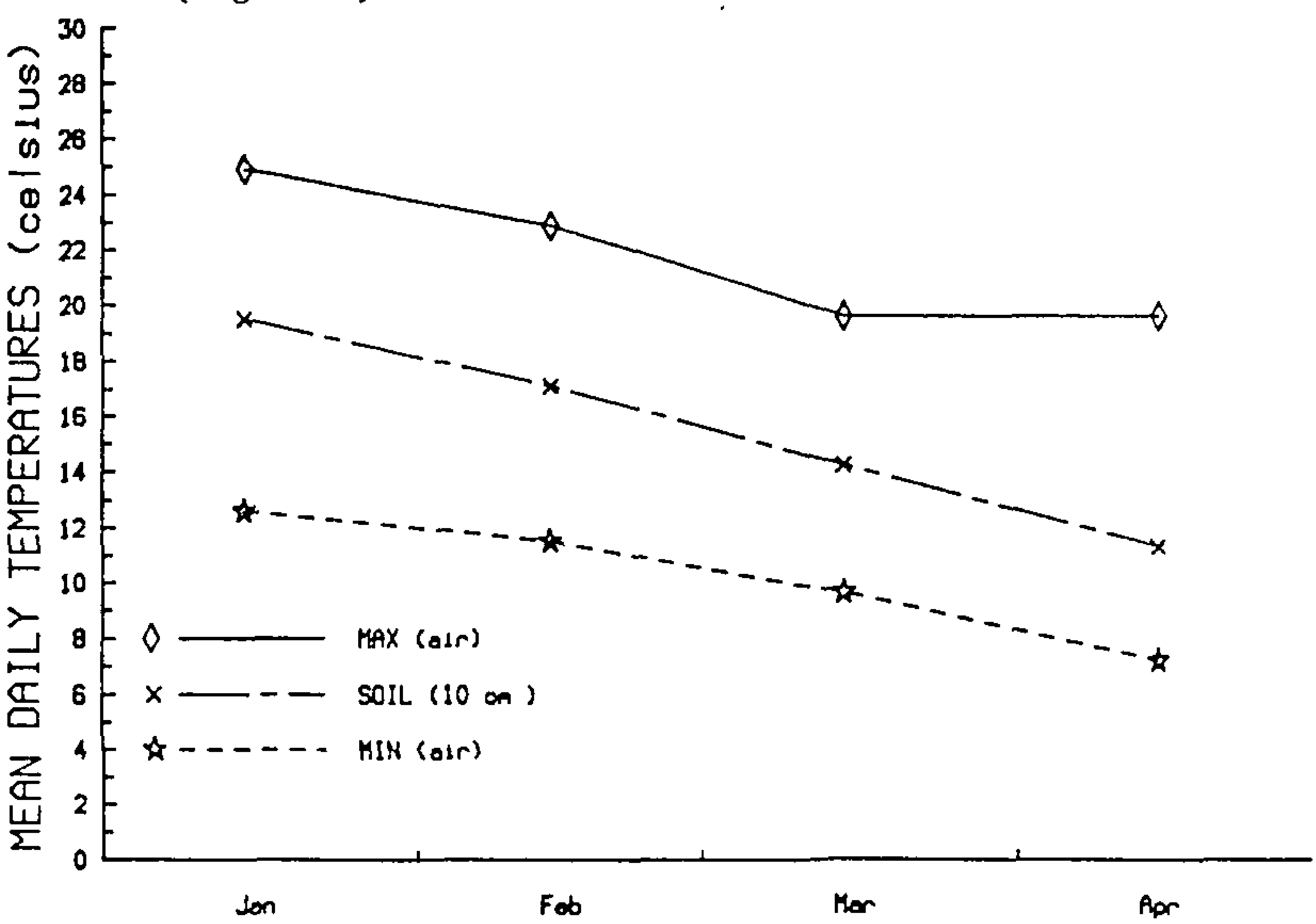

Figure 2. Mean monthly temperatures for the soil, maximum air and minimum air temperatures.

The commencement date for budding would be governed by the achievement of adequate growth in sufficient of the rootstocks to make budding practicable, as indicated by Eiseman and Thomas (2). For certain cultivars the availability of sufficiently mature budwood could also pose a restriction on commencement date. For example, in this experiment attaining mature budwood for the cultivar, 'Red Haven, for the 8 February budding was difficult, and would not have been practicable for a larger budding operation. Potentially this problem could be overcome by importation of budwood from earlier districts.

Although no attempt was made to determine the point at which a bud becomes sufficiently mature for successful budding it is apparent from attempts at December budding in Canterbury, on 18-month-old seedlings, that insufficient bud maturity in scionwood taken from local trees was responsible for poor bud acceptance, as more mature budwood obtained from the Hawkes Bay district was considerably more successful (Eiseman, personal observation).

The rootstocks for all budding times in this experiment were selected in early February for uniformity of girth based on attainment of a minimum diameter of 6 mm. In nurseries in Canterbury it is necessary in some seasons not to bud a substantial number of rootstocks in February due to insufficient girth. It is the observation of the authors that the bark on the underdeveloped seedlings continues to slip and their girth to increase later in the season at a time when both have ceased in the older rootstocks. It is therefore proposed that the rootstock selection criteria of choosing only the most advanced seedlings may have limited any opportunity to detect an extension of the budding season for any particular method. The proposed reason for this is that the seedlings used in this experiment had reached a growth plateau (quiescence), whereas if small stock had been selected for the late season budding treatments there may have been much more favourable results with them.

In their comparison of union formation between T- and chip-budded fruit and ornamental trees in the U.K., Skene *et al.* (6) cite improved bud unions and enhanced growth in the subsequent season as major advantages of chip-budding. Although not measured in this experiment poor growth or breakages at the bud union are not generally a problem in peach propagation in Canterbury. Both this observation and the failure to detect differences among the three methods of budding under comparison can probably be attributed to the prolonged autumns and milder winters experienced in Canterbury which provide more favourable conditions for union formation and bud survival than in the U.K.

The two methods of preparing the T-buds (with the 'wood-in' or with the little sliver of wood under the bark of the shield piece removed) appeared to have no significant difference. It is reported to be an advantage to use "dewooded" buds on maples and walnuts (8) and is a popular method for apricots in New Zealand. The former are all relatively more difficult to bud than peaches and would possibly have indicated improved results for the "wood-out" technique.

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SURFACTANTS AID UPTAKE OF CYTOKININ AND UREA INTO JUVENILE *PINUS RADIATA* PLANTLETS

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Abstract. The effects of surfactants Tween 80, Citowett, and Silwet L-77 on foliar absorption of cytokinin and urea on juvenile *Pinus radiata* plants were examined. BAP in the presence of either 0.2% Silwet L-77 or Citowett gave a 9 and 5-fold increase, respectively, in axillary shoots at the top of the plant as well as a marked increase in stem shoot number after 18 weeks. Tween 80 had little effect.

A 1% ^{15}N-urea + 0.1% Silwet L-77 foliar application doubled the amount of nitrogen absorbed. In the absence of L-77, seedlings tolerated 5% urea, whereas in the presence of 0.1% L-77 and urea concentrations higher than 2%, needle burning occurred.

Silwet L-77 ("Pulse", Monsanto) may be a useful surfactant for foliar applications of growth regulators, growth retardants, and nutrients to other plants.

REVIEW OF LITERATURE

Foliar applications of growth regulators, growth retardants, and nutrients are frequently used in horticulture and forestry. Absorption of nutrients through foliage can alleviate nutrient deficiencies more rapidly than soil application whenever nutrient uptake through roots is restricted. Growth regulators can be applied to leaves and growing tips to alter plant form for vegetative propagation or for commercial reasons and to promote flowering and senescence. Dixon *et al.* (2) found that oak (*Quercus alba*) seedling root and shoot growth was promoted with foliar mist applications of plant growth regulators in combination with foliar fertiliser solutions. Foliar applied cytokinins have been used to induce axillary branching and basal sprouts (5, 6) while gibberellins promote flowering (4). Ineffective spray applications may be due to poor foliar absorption caused in the main by epicuticular waxes impeding penetration.

Wetting agents or surfactants are often used to improve the performance from foliar applications of plant growth regulators and nutrients. Some of the more common ones reported include Tween 20, Tween 80, Buffer X (a proprietary surfactant) and Aromox C/12