

shoots (AS) were observed along axes in trees belonging to two litchi cultivars. It was observed that winter flushing did not inhibit flowering in alternate bearer litchi cultivar even in 'on' year. The growers can achieve more reliable flowering, especially in low-production cultivars by discouraging fall vegetative flushes through application of uniconazole (or its alternative pro-hexadion Ca) and potassium nitrate. In this investigation, girdling (in 75 % branches), paclobutrazol (2.5 g per m canopy diameter), KNO₃ (2%) brought high leaf relative water content, least winter flush and induced regular flowering (after normal flushing in August and mild or no flushing during November-December) in the alternate bearer 'China' litchi. Salicylic acid (2000 ppm) has been found to be inhibitory for plant health attributes. Younger trees of 'Shahi' litchi did flower every year but shown highest yield (1134 no. of fruits per tree against 356 in control) due to PBZ @ 2.0 g and highest number of cauliflorous shoots in tree receiving high dose of PBZ (3-4.0 g per m canopy diameter). The findings suggested that manual de-flushing during December month has been effective for flowering during 'off' year. No flowering can be induced even if tree sprayed with ethephon (400 to 2000 ppm) during winter or only application of PBZ during September month besides crucial winter temperature. There is also need of consecutive studies to soil moisture and temperature, photosynthetic rate, endogenous hormonal level during vegetative, floral bud differentiation for any intervention to assure flowering.

6.2.4 Standardization of *In-Vitro* Protocol for Mass Multiplication of Date Palm Cultivars Halawy and Khalas

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The date palm (*Phoenix dactylifera*) is one of the oldest fruit plants grown for its delicious fruit with high energy value. The plants can tolerate extremes of temperature and saline conditions of arid region. Therefore, in Thar dessert of Rajasthan and Kutch region of Gujarat several varieties were introduced and evaluated in our country, which have shown promising response. However, availability of quality planting material is one of the major limiting constraints in its area expansion programme. So far, it is multiplied by off-shoots which are cumbersome and not an efficient method of date palm multiplication. Some organizations have made efforts to develop *in-vitro* protocol but it is variety specific and demands for planting materials of commercial varieties are huge. Government is also supporting to import the tissue culture planting material which is very expensive. Therefore, alternative seems to be have our own protocol for mass multiplication of commercial varieties of date palm. In view of above, the present investigation was carried out in the Biotechnology Laboratory of ICAR-Central Institute for Arid Horticulture, Bikaner during 2017-18. The somatic embryos of date palm cultivars Halawy and Khalas were inoculated vertically on ½ MS media in culture tubes containing different concentrations of IBA and NAA (0.1, 0.2, 0.3 mg/l). Thereafter, culture tubes were incubated at 27 ± 2°C for 16 hours photoperiods under culture room up to 150 days. It was observed that at a higher concentration (0.3 mg/l) using both the hormones *in-vitro* roots and leaves were developed while at lower concentrations, response was comparatively poor. The average number of root and average root length per plantlet were recorded 4 and 8.2 cm respectively. Number of leaves were varied from 1- 6 with average 5.6 per plantlet while length of shoot/leaves ranged from 14.6 to 18.3 cm. Plants with well developed roots and leaves were placed in culture room for primary hardening under 27 ± 2 °C temperatures and 3000 lux light intensity for two months. Well survived plants then transferred to green house for secondary hardening under environment regime of 30 ± 2 °C temperature, 60-70 % relative humidity and 10000-15000 lux light intensity. Secondary hardened plants transplanted in the field for further evaluation purpose to assess their performance under field conditions. The protocol developed needs up-scaling for improving efficiency of mass multiplication of date palm quality planting materials.