

Effect of lignosulphonates on *Vanilla planifolia* shoot multiplication, regeneration and metabolism

ABSTRACT

Vanilla planifolia (*V. planifolia*) is a valuable orchidaceous plant, commonly grown for its pods that are used to produce the flavouring vanilla extract. Here, we evaluated the effect of calcium lignosulphonate (Ca-LIGN) and sodium lignosulphonate (Na-LIGN) on multiplication and regeneration of *V. planifolia* shoot tip culture. In 150 mg L⁻¹ Ca-LIGN medium, the most number of shoots per explant (5.78 ± 0.63) was successfully obtained. Besides, Ca-LIGN also enhanced the shoot bud and primordial formation rate, as seen under scanning electron microscopy. In contrast, medium containing 150 mg L⁻¹ Na-LIGN recorded the highest average of shoot length (4.72 ± 0.30 cm). Meanwhile, the best growth of root length (1.8 ± 0.32 cm) and root induction ($96.67 \pm 5.16\%$) were recorded on the explants treated with 150 mg L⁻¹ Na-LIGN rooting medium. All rooted plantlets successfully acclimatized in the greenhouse (100.00% survival rate). Further biochemical analysis revealed that Ca-LIGN increased the total protein, chlorophyll, sugar, flavonoid and phenolic contents of *V. planifolia*. Notably, expression of both ribulose-1,5-bisphosphate carboxylase (Rubisco) and phosphoenolpyruvate carboxylase (PEPC) genes were also elevated under the treatment of Ca-LIGN, implying a positive role in the photosynthetic process. Taken together, LIGN being an environmental friendly product could be used to enhance the growth and micropropagation of *V. planifolia*.