

Varaporn Veraplakorn 2013: Salt Tolerance in the Forage Legume
Stylosanthes guianensis CIAT 184. Doctor of Philosophy (Botany), Major
Field: Botany, Department of Botany. Thesis Advisor: Associate Professor
Malee NaNakorn, Ph.D. 127 pages.

Stylosanthes guianensis CIAT 184 (Stylo 184) is a highly valued forage legume containing high protein. However, it is not salt tolerant and therefore not suitable for planting in areas affected by salinity. This thesis carried out selection for salt tolerant Stylo 184 and investigated its tolerance mechanisms. Sixty grams of seed (approximately 37,500 seeds) was screened for salt tolerant individuals in 2% NaCl solution. In addition, one seed was selected from seed which did not germinate at 1% NaCl, but germinated when transferred onto salt free MS medium. This clone was considered as a less tolerant clone (T1) to compare salt tolerant mechanisms with the individuals that germinated in 2% NaCl.

Ten salt tolerant clones were selected and their growth compared with clone T1 on basal MS medium containing from 0 to 1.5% NaCl. Four clones, representative of salt tolerant clones, were selected on the basis of their 50% growth reduction dose (T2, T3, T4 and T5) and their ion content and enzyme production on salt media were compared to T1. Callus of T1 displayed exclusion mechanisms as would be expected of a glycophyte and as found in nonselected seedlings; it maintained the lowest Na^+ and Cl^- content, and maintained the highest K^+ content. The salt tolerant clones (T2, T3, T4 and T5), however, accumulated Na^+ and Cl^- as well as K^+ as osmolytes; a mechanism similar to what might be expected in halophytes. Shoots of all four tolerant clones (T2, T3, T4 and T5) had significantly higher levels of SOD activity after NaCl treatment and on a recovery medium. The other enzymes, however, showed less distinct differences compared to T1 with T3 and T4 having the same levels of CAT but lower levels of POX. T2 had higher CAT but lower POX than T1. T5 was the most distinctive by having particularly high levels of both CAT and POX.

Shoot regeneration, root induction, survival in soil and relative growth rate of the clones remained high even after long term maintenance in culture. Shoots of T1 and T5 produced 70.0 and 91.0% rooting, respectively with 69.0 and 90.0% survival in after being transferred to soil. All of these plants grew well and showed normal characteristics with flowering after 7 months.

The different mechanisms among clones of Stylo 184; osmotic adjustment using different ions and antioxidant system with higher constitutive enzymes can be applied as criteria for selection in other *Stylosanthes* spp. In addition, Stylo 184 salt tolerant clones will be available for further investigation into their salt tolerant mechanisms and appropriate field investigation.

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Thesis Advisor's signature

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