

## Profile of the PhD and Masters Thesis

- 1) **University** : The University of Reading
- 2) **Department** : Department of Agriculture
- 3) **Authors** : Gyambo Tshering
- 4) **Supervisor** : Professor John Barnet and Professor Tony Kindle
- 5) **Title of Thesis** : Causes of graft failure in walnut (*Juglans regia* L.)
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- 10) **Abstract of your thesis** : Graft union formation was studied in greenhouse-grown walnut (*Juglans regia* L.), using light microscopy for 90 days following grafting. Walnut graft union formation was similar in most respects to that reported by others in different tree species, but specific differences were noted in cell types contributing callus, mode of healing and time of union formation. The initial wound response was cell enlargement, division and formation of a necrotic layer in the graft interface. All living tissues between the xylem and epidermis were involved in callus formation and callus production occurred to a depth of several cells below the cut surface. Formation of a common cambium between the graft partners and the establishment of vascular continuity completed the union formation.

Anatomical studies showed that the difficulty in walnut grafting was due to a marked difference in cellular activity between stock and scion, manifested as a delay in or failure of stock and scion to produce wound parenchyma, especially in the scion. This delay in the formation of wound parenchyma may have been largely due to the failure of the vessels to become plugged, thus allowing excessive loss of water and desiccation of scion and eventually graft failure.

It has been found that factors influencing union formation do not act independently of one another but combine and act negatively or positively depending upon the situation and may have a cumulative effect. Graft failure in walnut was not caused by a single factor but by interplay of five interrelated critical elements. These were: the choice of scionwood, alignment of cambia of stock and scion, time of grafting, temperature under which grafts are grown and scion desiccation after grafting. If any of these critical factors was sub-optimal scion desiccation occurred through their influence on graft union formation. If rapid cell division, callus production and bridging between the graft partners did not take place in relatively short time after

grafting, scion desiccation resulted in graft failure.

Graft success was improved significantly by grafting well-matured scion wood with high moisture content collected from mid-January to mid-March. Scions sealed in plastic bags along with moist shredded paper or wood shaving stored at 5°C gave reliable results, and enhanced by coating the scion with paraffin wax. The best or ideal temperature for walnut grafting was found to be 22°C to 26°C.