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Short Note: Delayed Graft Incompatibility in Heteroplastic Interspecific Graft Between *Tectona grandis* L.f. and *Tectona hamiltoniana* Wall After Three Decades

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Summary

Extremely delayed graft-incompatibility and mortality of interspecific heteroplastic grafts of *Tectona grandis* and *T. hamiltoniana* after three decades has been reported. Possible causes of incompatibility have been discussed.

Key words: Graft-incompatibility, Heteroplastic grafts, *Tectona grandis*, *Tectona hamiltoniana*.

In the year 1966–68 under the project “Genetic Improvement of Teak (*Tectona grandis* L.f)” studies for standardization of technique for vegetative propagation of plus trees were undertaken and wedge and cleft grafting and bud grafting techniques were standardized (RAWAT and KEDHARNATH, 1968). Development of these techniques subsequently helped in establishment of model Clonal Seed Orchard at New Forest, the campus of Forest Research Institute, Dehradun.

During the course of these studies autoplasmic, homoplasmic and heteroplasmic grafts were made to study the compatibility of stock-scion in different stock-scion combinations.

Five wedge and cleft grafts each of the above mentioned three types were made on field grown stock of *Tectona grandis* Lf, in the year 1966–68. Interspecific heteroplasmic grafts were made using the scion material collected from mature trees of *Tectona hamiltoniana* Wall, growing in the campus of this Institute. These heteroplasmic grafts which were successfully established did not show any sign of graft incompatibility at their early growth period of 10 years but gradually they started

developing symptoms of graft incompatibility such as saddle like outgrowth of scion at the junction of stock and scion (*Fig. 1*). These interspecific heteroplasmic grafts died one by one between the age of 25 to 32 years when the symptoms of graft incompatibility became more pronounced. The oldest graft could survive upto 32 years. At this age the graft attained a height of 5 m, girth of scion 76 cm (at the junction of graft union) and girth of stock 64 cm. It would be worth to mention here that none of the grafts flowered till they survived.

Heteroplasmic or interspecific grafting is used in fruit tree breeding to produce small trees with early and rich flowering. The same effect is aimed at when grafting forest trees for seed orchards establishment (DORMLING, 1964). Problems of graft incompatibility or uncongeniality of stock and scion have been reported in a number of horticultural and forest tree species (MOSSE, 1962, HARTMANN and KESTER, 1968, COPEES, 1970, WRIGHT, 1972, TUBBS, 1973, HARTNEY, 1980, ZOBEL and TALBERT, 1984) and have been the subject of many investigations (PROEBSTRING, 1926, 1928, BRADFORD and SILTON, 1929; MC CLINTOK, 1948, HERRERO, 1951, THREL, 1954, STIGTER, 1956, and PITCHER, 1960).

It is a common occurrence that the scion may persist for few months, one or more years and then die. SCHONBACH (1960) reported that some grafts of *Populus* lived upto 7 years. Anatomical investigations carried out on these grafts have revealed that in these grafts xylem unions were almost complete but phloem junctions were unsatisfactory. EMMANUEL and BAGCHI (1984) observed the phenomenon of graft incompatibility with certain clones of *Tectona grandis* in homoplasmic grafts. Studies carried out in Sweden on heteroplasmic grafting in

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Figure 1. — A thirty-year-old interspecific heteroplastic graft of *Tectona grandis* (Stock) and *T. hamiltoniana* (Scion) which died due to incompatibility. Arrow mark shows the saddle like outgrowth of scion.

Pinus species have shown that grafts made using root stock of *Pinus mugo* and scion of *P. sylvestris* formed good graft unions provided that the stock used was of a vigorously growing race. If the root stock belongs to a slow growing race the scion grows faster (puts more girth) than the root stock and the swelling is formed above the graft union. Too rapid growth of scion may cause expulsion of scion (DORMLING, 1964).

Incompatibility in grafts of Douglas-fir has been reported (COPES, 1970) wherein transport of elaborated food material from crown to root stock is inhibited resulting in over growth of scion. Many grafts of this type die in time and incompatibility is a major problem in Douglas-fir breeding. Internal symptoms of graft incompatibility in this species have been studied in two-day-old to four-year-old grafts by COPES (1970).

In the present case of *Tectona* the possible reasons for development of graft incompatibility due to over growth of scion could be physiological, genetical and/or interaction of stock and scion. However, anatomical studies on tissues of graft union may throw more light and confirm the exact cause as has been done in case of Douglas-fir (*Pseudotsuga menziesii*) by COPES (1970).

In the genus *Eucalyptus* interspecies heteroplastic grafts have been reported between *Eucalyptus ovata* and *E. racemosa* (FIELDING, 1948), *E. deglupta* and *E. grandis*, between *E. grandis* and *E. camaldulensis* and between *E. blackelye* and *E. camaldulensis* (HARTNEY, 1980). In some cases specially when *E. grandis* scion was grafted onto root stock of *E. deglupta* the scion died even though the effective graft union was established and the scion had been growing actively for several months.

Most studies on the causes of incompatibility have described the incompatibility systems with little attempt to understand the physiology of incompatibility. However, genotypes of the root stock and scion, method of grafting may effect graft incompatibility as graft of *Eucalyptus grandis* scion on to half-sib *E. grandis* root stock had less incompatibility than grafts on random root stocks (VAN WYK, 1977 a, 1977 b, VAN WYK and HODGSON, 1972). Similarly patch budded grafts showed the symptoms of graft incompatibility until shortly before the death of tree and the death occurred in trees several years old (DAVIDSON, 1977). In countries with several species available the possibilities of successful interspecific grafts are considerable greater. Studies with forest trees have been made by MERGEN (1954), PITCHER (1960) and AHLGREN (1962).

It would not be out of place to mention here that an intergeneric heteroplastic graft successfully established at this Institute in 1964 using stock of *Bambax ceiba* L. and scion of *Choessia speciosa* St. Hill which belong to the same family Bombacaceae has not developed any symptom of graft-incompatibility and flowers regularly each year.

The present communication perhaps seems to be the first report for the delayed graft failure after three decades so far as the heteroplastic grafting in the genus *Tectona* is concerned.

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