# PERFORMANCE OF *ACACIA AURICULIFORMIS* PROVENANCES AT 18 MONTHS ON FOUR SITES

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**AWANG, K., NOR AINI, A. S., ÅDJERS, G., BHUMIBHAMON, S., PAN, F. J. & VENKATESWARLU, P. 1994. Performance of *Acacia auriculiformis* provenances at 18 months on four sites.** Four trials of *Acacia auriculiformis* provenances in China, Indonesia, Malaysia and Thailand at 18 months were analysed for survival and growth. Twenty-five provenances from three geogrphic regions, viz. Papua New Guinea, Northern Territory and Queensland, Australia were tested. Significant differences were found among the provenances at each site, as well as between sites and the interaction between provenances and sites. The best sites were those in Indonesia

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and Thailand and the poorest was the one in Taiwan, China. Stability analysis of the provenance x site interaction indicated that two provenances (Noogoo Swamp, Northern Territory and South Coen River, Queensland) were most stable across sites. The Noogoo Swamp provenance was also one of the top performers.

Key words: *Acacia auriculiformis* provenances - survival - growth - stability - China - Indonesia - Malaysia - Thailand

**AWANG, K., NOR AINI, A. S., ÅDJERS, G., BHUMIBHAMON, S., PAN, F.J. & VENKATESWARLU, P. 1994. Prestasi provenans *Acacia auriculiformis* yang berumur 18 bulan di empat tapak.** Empat percubaan provenans *Acacia auriculiformis* di China, Indonesia, Malaysia dan Thailand yang berumur 18 bulan dianalisis untuk survival dan tumbesaran. Dua puluh lima provenans dari tiga kawasan geografi iaitu Papua New Guinea, Northern Territory dan Queensland di Australia diuji. Perbezaan-perbezaan yang ketara antara provenans didapati di setiap tapak, di antara tapak serta interaksi antara provenans dan tapak-tapak. Tapak yang paling baik didapati di Indonesia dan Thailand manakala tapak yang paling lemah ialah di Taiwan, China. Analisis kestabilan provenans x interaksi tapak menunjukkan bahawa dua provenans (Noogoo Swamp, Northern Territory dan South Coen River, Queensland) adalah paling stabil. Provenans Noogoo Swamp juga adalah antara yang terbaik.

## Introduction

*Acacia auriculiformis* A. Cunn. ex Benth., native to Australia, Indonesia and Papua New Guinea, is a promising tropical acacia for a number of uses. It is a fast-growing, nitrogen-fixing tree which has shown adaptability to a wide range of environmental conditions. Reports have indicated that it is especially suitable for rehabilitating adverse sites such as tin tailings (Mitchell 1957, Awang & Venkateswarlu 1992), *Imperata cylindrica* grassland (Voogd 1948), eroded land (Ali 1986), wasteland (Jha 1987) and overburden mining areas (Prasad & Chadhar 1987). It thrives well on acidic (Turnbull 1989), alkaline (Basappa 1983), or saline soils (Midgley *et al.* 1986), and in areas polluted by industrial gases (Agrawal *et al.* 1986, Kong 1988). The wood can be used for fuel (Brewbaker *et al.* 1983), plywood (Patanaprapapan 1980), carving (Rajan *et al.* 1979), flooring and furniture (Chomcharn *et al.* 1986), and pulp and paper (Ku & Chen 1984, Logan 1991). Commercial quantities of tannins and natural dye can be extracted from the bark (Kasmudjo 1979, Abdul Razak *et al.* 1981).

In 1987, the Forestry/Fuelwood Research and Development (F/FRED) Project of Winrock International and the Australian Tree Seed Centre of Commonwealth Scientific and Industrial Research Organization (CSIRO) jointly organized the first extensive provenance seed collection of *A. auriculiformis* in Papua New Guinea and northern Australia (Gunn *et al.* 1987). As a follow-up, the F/FRED Project further collaborated with the Australian Centre for International Agricultural Research (ACIAR) to evaluate 25 of the provenances collected by establishing multilocational trials in Zimbabwe and seven other countries in Asia. Yang and Zeng (1991) and Luangviriyasaeng *et al.* (1991) reported on their performance at 18 and 12 months on a site in mainland China and three of the four sites in

Thailand respectively. This paper reports on their performance at 18 months in Indonesia, Malaysia, Republic of China (Taiwan) and the fourth site in Thailand.

## Materials and methods

### *Trial sites*

The four sites involved in this study are described in Table 1. They ranged in elevation from 16 to 150 m and in annual rainfall from 1244 to 2404 mm. The soils were classified according to Soil Taxonomy (Soil Survey Staff 1975). All the sites had isohyperthermic temperature regime. The moisture regime was ustic for Thailand site and udic for the rest. The soil pH ranged from 4.4 to 7.4. The slope ranged from 0 to 5%. The Thailand site was under a *Peltophorum inerme* plantation, and the others were under *Imperata* grassland. The sites were fully cultivated before planting.

### *Seedling preparation*

Twenty-eight seedlots of *A. auriculiformis* were sent out by the CSIRO Tree Seed Centre for the trials, with an understanding that only 25 of them would be planted. But two sites planted more than that. However, only the 25 seedlots planted on all the four sites were analysed here. Table 2 provides details of their seed origins. They cover three major geographic regions, Papua New Guinea, Northern Territory and Queensland, of the species natural distribution.

Nursery technique followed the guidelines provided in the manual for field operation (Boland & Pinyopusarerk 1988). In summary, seed was pre-treated by pouring boiling water on to the seed and soaking the seed overnight in the gradually cooling water. The treated seed was sown in germination beds and later transplanted into polythene bags. No special inoculation with *Rhizobium* was made in the nursery. The seedlings were kept under about 50% shade, and they were hardened off by restricted watering 1-2 weeks before planting out. Planting was done when the seedlings were about 3-4 months old.

### *Field establishment*

A randomised complete block design with six replicates was used. Each replicated plot consisted of 16 trees (4 × 4) spaced at 3 × 3 m. Two buffer rows were planted surrounding the trial to minimise edge effects. No fertilizer was applied at planting. Weeding was done frequently, especially at the initial stages of development.

**Table 1.** Details of trial sites

| Trial Site | Lat. (°N) | Long. (°E) | Alt. (m) | Mean annual rainfall (mm) | Mean annual temp. (°C) Max. | Min. | Av. | Soil |
|---|---|---|---|---|---|---|---|---|
| 1. Chou-Fong, Pin-Lin, Taiwan, Republic of China | 23° 47' | 121° 29' | 16 | 2076 | 26.7 | 19.7 | 23.2 | Sand-skeletal, mixed, Lithic Tropopsamments, isohyperthermic and udic; pH 7.4. |
| 2. Lad Krating Plantation, Chacheongsao, Thailand | 13° 30' | 101° 12' | 150 | 1244 | 36.8 | 20.3 | 28.6 | Fine-loamy, mixed, Paleustult,isohyperthermic and ustic; pH 5.2. |
| 3. Experimental Farm, Universiti Pertanian Malaysia, Malaysia | 3° 2' | 101° 42' | 33 | 2141 | 32.8 | 22.0 | 27.4 | Fine-loamy, mixed, Typic Hapludults, isohyperthermic and udic; pH 4.4. |
| 4. Riam Kiwa Trial Area, Banjar Baru Indonesia | 3° 9'S | 115° 7' | 100 | 2404 | 26.0 | 22.5 | 24.2 | Very fine, kaolinitic, Typic Hapludalfs, isohyperthermic and udic; pH 5.5. |

**Table 2.** Details of the origins of the 25 provenances of *Acacia auriculiformis*

| CSIRO seedlot No. | Provenance | Latitude (S) | Longtitude (E) | Altitude (m) | Number parents |
|---|---|---|---|---|---|
| 15483 | Archer River, Qld | 12° 26' | 142° 57' | 100 | 5 |
| 15697 | South Coen, Qld | 14° 07' | 143° 16' | 160 | 10 |
| 15985 | Mt Molloy, Rifle Creek, Qld | 16° 41' | 145° 17' | 380 | 10 |
| 16142 | Coen River, Qld | 13° 53' | 143° 03' | 170 | 7 |
| 16145 | Wenlock River, Qld | 13° 06' | 142° 56' | 130 | 20 |
| 16484 | Morehead River, Qld | 15° 03' | 143° 40' | 50 | 6 |
| 16485 | Kings Plain, Qld | 15° 42' | 145° 06' | 150 | 7 |
| 16147 | Noogoo Swamp, NT | 12° 23' | 131° 00' | 28 | 5 |
| 16148 | Manton River, NT | 12° 50' | 131° 07' | 100 | 10 |
| 16149 | Douglas River, NT | 13° 51' | 131° 09' | 70 | 10 |
| 16151 | Mary River, NT | 13° 36' | 132° 08' | 120 | 8 |
| 16152 | East Alligator River, NT | 12° 17' | 132° 55' | 10 | 10 |
| 16153 | Cooper Creek, NT | 12° 06' | 133° 11' | 40 | 5 |
| 16154 | Goomadeer River, NT | 12° 08' | 133° 41' | 50 | 9 |
| 16155 | Mann River, NT | 12° 22' | 134° 08' | 60 | 4 |
| 16156 | Yarunga Creek, NT | 12° 18' | 134° 48' | 50 | 6 |
| 16160 | South Alligator River, NT | 13° 16' | 132° 19' | 100 | 10 |
| 16163 | Elizabeth River, NT | 12° 36' | 131° 04' | 40 | 9 |
| 16187 | Melville Island, NT | 11° 55' | 130° 50' | 1 | 7 |
| 16101 | North Bensbach to Weam, PNG | 8° 50' | 141° 15' | 10 | 16 |
| 16103 | South Balamuk, PNG | 9° 00' | 141° 15' | 10 | 7 |
| 16105 | Balamuk on Bensbach River,PNG | 8° 55' | 141° 17' | 20 | 12 |
| 16106 | North Mibini, PNG | 8° 49' | 141° 38' | 40 | 35 |
| 16107 | Old Tonda Village, PNG | 8° 55' | 141° 33' | 40 | 19 |
| 16108 | Mari Village, PNG | 9° 11' | 141° 42' | 5 | 8 |

Qld = Queensland, Australia, NT = Northern Territory, Australia
PNG = Papua New Guinea

### *Assessments and data analyses*

Survival, height, diameter at 10 cm above ground, and diameter at breast height (DBH at 1.3 m) were assessed every 6 months. Geometric mean DBH (square root of the sum of the squares of each individual stem diameter) was used for multi-stemmed trees.

Analyses of variance were conducted to investigate differences among provenances at each site as well as interactions between provenance and site. Only survival, DBH and height at 18 months were analysed. To investigate the provenance stability across sites, stability indexes were estimated for DBH and height by using the model described by Eberhart and Russell (1966). MPTStat, the statistical package developed by F/FRED, was used for all analyses.

## Results

### *Within site difference*

The results of analyses of variance done for each site indicated that there were significant differences among the provenances in at least one trait (Table 3). Significant differences were found in all traits in China, only in height and DBH in Indonesia and Malaysia, and in height alone in Thailand. Among the traits analysed, survival was the least variable and DBH the most variable, with coefficient of variation ranging from 1 to 7% and 10 to 19% respectively.

Composite ranking ( mean ranking of survival, DBH and height) of the provenances shows that their order was not the same for all sites (Table 3). On three sites (China, Malaysia and Thailand), four out of the five best performing provenances came from a particular geographic region. All were from Northern Territory for China (Douglas River, Noogoo Swamp, Manton River and South Alligator River) and Thailand (Douglas River, Nogoo Swamp, Manton River and Cooper Creek), whilst they were from Queensland (Kings Plain, Wenlock River, Morehead River and Archer River) for Malaysia. In Indonesia, out of five best performing provenances, two were from Papua New Guinea (Old Tonda Village and South Balamuk), two were from Northern Territory (Noogoo Swamp and Mann River), and one from Queensland (Morehead River). On all sites, except Malaysia, the poorer performing provenances were from Northern Territory, especially the seedlots from Melville Island and Elizabeth River. For Malaysia, the poorest provenance was from South Balamuk, Papua New Guinea.

### *Intersite analyses*

Pooled analyses of variance indicated that all the three sources of variance (provenance, site and the interaction between provenance and site) significantly accounted for the variations in height and DBH but not in survival (Table 4). By far,

**Table 3.** Mean performance of *A. auriculiformis* provenances on four sites at 18 months after planting

| CSIRO Seedlot No. | China Sur (%) | China Ht (m) | China DBH (cm) | China Rank | Malaysia Sur (%) | Malaysia Ht (m) | Malaysia DBH (cm) | Malaysia Rank | Indonesia Sur (%) | Indonesia Ht (m) | Indonesia DBH (cm) | Indonesia Rank | Thailand Sur (%) | Thailand Ht (m) | Thailand DBH (cm) | Thailand Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15483 | 97 | 2.0 | 3.5 | 8 | 99 | 4.7 | 4.4 | 5 | 100 | 6.3 | 5.7 | 8 | 100 | 5.7 | 6.5 | 5 |
| 15697 | 94 | 2.1 | 3.4 | 12 | 98 | 4.9 | 3.8 | 12 | 100 | 6.0 | 5.6 | 12 | 100 | 5.5 | 6.4 | 12 |
| 15985 | 91 | 1.9 | 2.7 | 21 | 97 | 4.0 | 2.9 | 24 | 100 | 5.2 | 4.7 | 17 | 100 | 5.2 | 6.4 | 17 |
| 16142 | 94 | 2.2 | 3.5 | 6 | 96 | 5.1 | 4.8 | 8 | 100 | 5.1 | 5.1 | 18 | 100 | 5.4 | 6.6 | 8 |
| 16145 | 94 | 2.1 | 3.2 | 16 | 100 | 4.6 | 4.2 | 3 | 100 | 6.1 | 5.9 | 6 | 100 | 5.3 | 6.1 | 19 |
| 16484 | 92 | 1.8 | 2.9 | 22 | 99 | 4.8 | 4.4 | 3 | 100 | 6.6 | 6.2 | 2 | 100 | 5.5 | 6.6 | 7 |
| 16485 | 90 | 2.1 | 3.3 | 17 | 99 | 4.9 | 4.8 | 1 | 100 | 6.2 | 5.5 | 10 | 100 | 5.3 | 6.5 | 14 |
| 16147 | 95 | 2.2 | 3.4 | 3 | 98 | 4.9 | 4.6 | 6 | 100 | 6.1 | 6.3 | 3 | 100 | 5.7 | 6.8 | 2 |
| 16148 | 95 | 2.2 | 3.4 | 3 | 100 | 4.1 | 4.3 | 11 | 100 | 5.0 | 5.5 | 16 | 100 | 5.8 | 6.9 | 1 |
| 16149 | 99 | 2.2 | 3.5 | 1 | 98 | 5.1 | 4.2 | 7 | 100 | 4.5 | 4.3 | 23 | 100 | 5.7 | 6.5 | 5 |
| 16151 | 97 | 2.1 | 3.2 | 10 | 98 | 4.6 | 3.7 | 15 | 100 | 4.5 | 4.2 | 24 | 100 | 5.1 | 6.3 | 20 |
| 16152 | 98 | 2.3 | 2.7 | 9 | 99 | 5.2 | 4.2 | 2 | 100 | 5.0 | 5.2 | 18 | 100 | 5.6 | 6.2 | 15 |
| 16153 | 73 | 1.9 | 2.7 | 23 | 96 | 4.6 | 3.8 | 18 | 100 | 4.5 | 4.1 | 25 | 100 | 6.5 | 6.6 | 3 |
| 16154 | 95 | 2.2 | 2.7 | 14 | 100 | 4.4 | 3.4 | 14 | 100 | 5.2 | 5.0 | 18 | 100 | 5.6 | 6.4 | 11 |
| 16155 | 95 | 2.1 | 3.6 | 6 | 100 | 3.9 | 2.8 | 20 | 100 | 6.3 | 5.8 | 5 | 100 | 5.4 | 6.6 | 8 |
| 16156 | 93 | 2.0 | 3.2 | 18 | 99 | 4.1 | 3.7 | 16 | 100 | 5.6 | 6.3 | 7 | 100 | 4.9 | 6.0 | 24 |
| 16160 | 98 | 2.2 | 3.2 | 3 | 98 | 4.5 | 3.8 | 16 | 100 | 4.9 | 4.4 | 21 | 100 | 4.6 | 6.1 | 23 |
| 16163 | 97 | 2.0 | 3.2 | 13 | 98 | 4.1 | 2.9 | 23 | 100 | 4.9 | 4.4 | 22 | 100 | 5.0 | 6.1 | 22 |
| 16187 | 93 | 1.7 | 2.5 | 25 | 98 | 4.5 | 3.4 | 18 | 100 | 5.2 | 5.2 | 15 | 98 | 5.2 | 6.3 | 25 |
| 16101 | 86 | 1.8 | 2.6 | 24 | 100 | 4.5 | 4.1 | 8 | 100 | 5.4 | 6.0 | 10 | 100 | 5.0 | 6.9 | 12 |
| 16103 | 90 | 2.0 | 3.2 | 19 | 94 | 3.5 | 2.4 | 25 | 100 | 5.8 | 6.4 | 4 | 100 | 5.6 | 6.6 | 4 |
| 16105 | 97 | 1.9 | 3.3 | 14 | 100 | 3.8 | 2.8 | 21 | 100 | 5.2 | 5.7 | 14 | 100 | 5.1 | 6.7 | 15 |
| 16106 | 94 | 1.8 | 3.0 | 20 | 92 | 4.5 | 4.0 | 22 | 100 | 5.7 | 6.2 | 8 | 100 | 5.3 | 6.2 | 18 |
| 16107 | 99 | 1.9 | 3.3 | 11 | 99 | 4.8 | 4.0 | 8 | 100 | 6.3 | 6.9 | 1 | 100 | 5.2 | 6.8 | 10 |
| 16108 | 95 | 2.3 | 3.7 | 2 | 99 | 4.6 | 3.4 | 13 | 100 | 5.4 | 5.9 | 13 | 100 | 5.2 | 6.1 | 20 |
| SE ± | 2.80 | 0.13 | 0.25 | | 1.68 | 0.24 | 0.28 | | - | 0.26 | 0.33 | | 0.43 | 0.28 | 0.28 | |
| CV % | 7 | 15 | 19 | | 4 | 13 | 18 | | - | 12 | 15 | | 1 | 13 | 10 | |
| Mean | 93.5 | 2.04 | 3.17 | | 97.9 | 4.50 | 3.80 | | - | 5.48 | 5.46 | | 99.9 | 5.37 | 6.51 | |
| F.val | *** | * | * | | ns | *** | *** | | | *** | *** | | ns | * | ns | |

Sur = Survival, Ht = Height, DBH = Diameter breast height, Rank = Composite ranking,
* Significant at 5%; *** significant at 0.1%; ns = not significant at 5%.

variations across sites contributed the highest proportion to the pooled mean sum of squares. Much of these differences were due to the markedly poor performance of all provenances on China site (Table 3). Overall, the best performance was recorded in Thailand and Indonesia.

**Table 4.** Pooled analysis of variance for height and diameter at breast height based on means over six replications

| Source | D.f. | Mean sum of squares | | |
|---|---|---|---|---|
| | | Survival (%) | Height (m) | DBH (cm) |
| Provenances | 24 | 9.301 | 0.206* | 0.355* |
| Sites | 3 | 233.184 | 63.980** | 60.000** |
| Provenances x Sites | 72 | 7.483 | 0.180* | 0.204* |
| Site S + P x S | 75 | | 2.732 | 2.595 |
| Site (linear) | 1 | | 189.990** | 178.941** |
| Provenance x Site (linear) | 24 | | 0.190* | 0.185* |
| Pooled Deviation from Reg. | 50 | | 0.207** | 0.225** |
| (15483) Archer River, Qld | 2 | | 0.102 | 0.052 |
| (15697) South Coen, Qld | 2 | | 0.103 | 0.036 |
| (15985) Mt Molloy, Qld | 2 | | 0.091 | 0.242 |
| (16145) Wenlock River, Qld | 2 | | 0.273 | 0.314 |
| (16485) Kings Plain, Qld | 2 | | 0.385 | 0.486 |
| (16147) Noogoo, NT | 2 | | 0.059 | 0.289 |
| (16154) Goomadeer River, NT | 2 | | 0.159 | 0.037 |
| (16160) S. Alligator River, NT | 2 | | 0.186 | 0.424 |
| (16187) Melville, NT | 2 | | 0.068 | 0.027 |
| (16101) N. Bensback, PNG | 2 | | 0.094 | 0.321 |
| (16106) N. Mibini, PNG | 2 | | 0.038 | 0.250 |
| Pooled error | 480 | 3.974 | 0.122 | 0.120 |

Note: Only the provenances for which the deviation from regression is not significant are presented in table;
* Significant at 5%, ** Significant at 1%.

A study of provenance x site interaction can lead to a successful evaluation of stable provenances across sites. Using a regression technique, a provenance is considered stable when the regression coefficient (b) is 1.0 and mean squares of deviations from regression ($s^2d$) is zero (Eberhart & Russell 1966). Both height and DBH were significantly affected by the interaction factor indicating that the provenance responded differently to a change in environment (Table 4). The significant provenance x site (linear) comparison indicated that the stability parameter b was not the same for all provenances. The mean squares due to pooled deviations was significant, indicating that the performances of at least some of the provenances were not stable over sites. A larger portion of the sum of squares of provenance x site interaction (75% for DBH and 80% for height) was accounted for by the deviations from regression. Only 23% for DBH and 20% for height were

accounted for by the linear regression on the means in different site situations.

Estimates of regression b and $s^2d$ did not show a wide range of values (Table 5). Only the provenances for which the $s^2d$ was not significant are presented. For these provenances, the regression coefficients were not significantly different from unity. The Archer River provenance from Queensland had high mean DBH and height, but b was less than 1.0 for DBH and more than 1.0 for height, indicating that this provenance did not respond as much to better sites as other provenances did. For other provenances not in Table 5, $s^2d$ were significantly different from zero, suggesting that their performance on different sites cannot be predicted. Among the provenances, those from Noogoo Swamp, Northern Territory and South Coen, Queensland were most stable as they had high height and DBH with a unit b and $s^2d$ not significantly different from zero.

**Table 5.** Mean height, DBH, regression response indexes (b) and deviations from regression ($s^2d$) for a few provenances based on four sites

| CSIRO Seedlot | Height (m) | | | DBH (cm) | | |
|---|---|---|---|---|---|---|
| | Mean | b | $s^2d$ | Mean | b | $s^2d$ |
| 15483 | 4.66 | 1.188 | - 0.0712 | 5.03 | 0.865 | - 0.1127 |
| 15697 | 4.65 | 1.096 | - 0.0705 | 4.79 | 0.929 | - 0.1206 |
| 15985 | 4.06 | 0.9789 | - 0.0769 | 4.18 | 1.124 | - 0.0173 |
| 16145 | 4.54 | 1.059 | - 0.0145 | 4.86 | 1.914 | - 0.018 |
| 16485 | 4.65 | 1.079 | - 0.0704 | 5.04 | 1.84 | - 0.1048 |
| 16147 | 4.72 | 1.081 | - 0.092 | 5.29 | 1.014 | - 0.006 |
| 16154 | 4.35 | 0.943 | - 0.044 | 4.41 | 1.082 | - 0.120 |
| 16160 | 4.05 | 0.758 | - 0.029 | 4.38 | 0.793 | - 0.0734 |
| 16187 | 4.12 | 1.04 | - 0.087 | 4.35 | 1.119 | - 0.125 |
| 16101 | 4.18 | 1.013 | - 0.0750 | 4.91 | 1.252 | - 0.022 |
| 16106 | 4.34 | 1.104 | - 0.103 | 4.99 | 1.057 | - 0.013 |
| Mean | 4.35* | | | 4.74* | | |

*Mean of 25 provenances.
Only the provenances for which the deviation from regression is not significant are presented in table.

## Discussion

The results clearly indicate that there were significant provenance x site interactions, with different groups performing well on different sites. For three sites (China, Malaysia and Thailand), the best group of provenances obtained on the site were mostly from the same geographic region of the seed source. However, these regions were not common to all the sites. China and Thailand had groups from Northern Territory, whilst Malaysia had a group from Queensland. Similar results have been reported by Luangviriyasaeng *et al.* (1991) on the performance at 12 months at three other sites in Thailand (Sai Thong, Kanchanaburi and Sakaerat). In contrast, there was no such consistency on the site in Indonesia.

The poor overall performance at Pin-Lin, China was expected. This is the site with the highest latitude and the lowest average temperature. Moreover, the soil at the site is generally poor. It is sandy, with a frangipan about 33 cm from the surface. Despite the good moisture regime, favourable growth is difficult to attain with this type of soil. Thus, low temperature and the poor soil are the most likely reasons for the poor growth.

The stability analysis based on provenance x site interaction resulted in two provenances (16147:Noogoo Swamp, NT and 16142:Coen River,Qld) being identified as stable across the sites. The Noogoo Swamp provenance was also one of the top performers. This suggests that it is the most preferred provenance for planting in the locations evaluated in this study.

Provenance performance may change with time. Furthermore, only survival and growth were assessed here. At a later stage, other important traits such as tree form and wood properties may have to be considered in making the selection. At that time, the provenances may be classified not only based on performance but also taking into view the various potential uses which require different types of ideotype.

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