

FORESTRY

Controlled Document



APPENDIX 3 - Establishment Report

FOR-RDV-REP-Establishment report R117-QLD-REV1

(Review date: 6/12/2021)

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Date: 6/12/2021

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1. SCOPE AND PURPOSE

This report details the establishment of Experiment R117. This experiment is investigating the increase in within row spacing between sandalwood trees. This report is to record the actual activities, design, layout and application timing for the QUINTIS Research and Development records.

2. DEFINITIONS/ACRONYMS

LTH	Long term host
STH	Short term host
Sa	<i>Santalum album</i>
masl	Metres above sea level
ha	hectares
mm	millimetres
QLD	Queensland
WA	Western Australia
RCB	Randomised Complete Block
SPH	Stems per hectare
DOB_20	Diameter Over bark at 20 cm above ground
DBH	Diameter at Breast Height

3. RESPONSIBILITIES

OWNERSHIP	RESPONSIBILITY
R&D Team Lead	The Author of this Report is the Subject Matter Expert (SME) identified by the Company to best create this document. The Author will remain responsible for its update as required and in conjunction with the Compliance Officer.
Document Controller	The Document Controller is responsible for the creation of Templates and the upload of documents to the Company Document Management System (CDMS). They are also responsible for the maintenance of the Document Rollout Process and the implementation of rolling out changes and new documents to the appropriate managers or external parties where applicable. <i>* This is a position that can be held by different roles in the Company as determined by the Company.</i>
Regional Researcher	The Regional Researcher shall have the following responsibilities: • Provide plans to the Plantation manager for operations as required. • Ensure implementation of all planned trial activities.
Plantation Managers	The Plantation Managers shall have the following responsibilities: • Provide sufficient resources to implement operations as planned. • Ensure that SLO's are developed for tasks associated with this or any activities. • Verify that employees are trained and competent in the use of the tools and equipment as required.



- Ensure employees are provided with, educated in the use of, and wear the appropriate PPE when performing activities associated with this Procedure.

4. TRIAL CODE

R117 – Effect of increased within row spacing of sandalwood

5. TRIAL RATIONAL

The standard within row spacing for sandalwood trees in most standard configurations is 2.75 m (505 SPH). However, trials and inventories show that there is clear within row competition as early as from age 3. Future plantings will increase the within row spacing to 3.1 m (448 SPH).

There are clear benefits in the establishment at closer spacing, including quicker initial height growth and better stem form being the most definite, but without selective thinning the competition for space has a negative effect. It is also unclear how or if closer (or further) spacing between trees affects root development and host-interaction.

This trial will look at three within rows spacings (2.4 m, 3.1 m and 3.9 m) and assess how these treatments affect growth and form and nutritional uptake (specifically Nitrogen).

As this site will also be utilised as a seed production area, the flowering and seed production in the various spacing treatments will be noted.

6. OBJECTIVES

This experiment has the following key objectives:

- It will investigate the difference in sandalwood performance and form with increasing within row spacing.
- The planting will also be utilized as a seed production area.

7. SITE

7.1 TRIAL LOCATION

The experiment is located within the QUINTIS Dalbeg estate on Stand 74.

Table 1: Site details.

Plantation/Compartment/Stand:	Dalbeg 74
State:	QLD
Latitude:	-20.221516
Longitude	147.2876
Mean Annual Rainfall:	10-yr average = 865 mm
Altitude (masl):	60 m
Slope:	0°
Aspect:	Flat
Total Trial Area:	2.6 ha
Planted:	4 November 2021

Location map of the QUINTIS Dalbeg estate Stand 74 is attached in **Appendix A**.



7.2 SITE HISTORY

Prior to 2012, the site had annual cropping of sugar cane. Between 2012 and planting it remained fallow.

7.3 SOIL

The soils on this site are described as Sodosols (6Dyg), alkaline loam over sodic clay. Alluvial deposits associated with abandoned or seldom active stream courses (levees, splays, prior streams, distributary channels, abandoned and infilled streambeds).

7.4 CLIMATE

The climate is typical inland northern Queensland monsoonal. Cool dry winters with occasional frosts and hot humid summers with monsoons occasionally reaching inland. The long-term annual rainfall is 736mm.

Table 2: BOM data from Dalbeg (33291) Lat: 20.31° S Lon: 147.30° E Elevation: 35 m.

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
max temp °C	31.0	29.8	29.2	26.9	24.7	23.2	22.0	22.0	25.1	27.4	29.7	30.2
Min temp °C	25.1	25.0	25.1	20.9	16.7	12.8	11.2	15.8	17.8	23.4	25.4	25.6
Av Rainfall (mm)	181.0	181.5	102.1	38.0	22.8	27.7	18.8	11.8	5.1	20.3	37.1	102.0

8. TRIAL DESIGN AND LAYOUT

The trial consists of a Standard (STD) configuration with 2 sandalwood spacing treatments.

8.1 DESIGN

The trial design is a Randomised Complete Block (RCB), with 4 replications of the 2 treatments.

Table 3: Trial design details.

Compartment/Stand	Dalbeg 74
Trail	R117
Design	RCB
No. of treatments	2
No. of Replicates	4
No. of plots	8
Plot size	0.0674 ha
Trial area	0.592 ha
No. of rows per plot	6
No. of Sa trees per plot Trt 1	39
Within row spacing Trt 1	2.4
No. of Sa trees per plot Trt 2	24
Within row spacing Trt 2	3.9
No. of LTH trees per plot	18
within row spacing:	3.1
Between row spacing for all	3.6



- R117 – is an STD configuration. Sandalwood and LTH are in separate rows. The LTH for all plots in this trial will be *Dalbergia lanceolaria*.



9. OPERATIONS

Operation	Timing	Contractor	Comments
Site weed spray	07/2021	QUINTIS	
Cultivation	08/2021	External contractor	
Laser levelled	10/2021	External contractor	
Mound formation	10/2021	External contractor	
Dripper irrigation installed	10/2021	QUINTIS	
Mound weed spray	3/11/2021	QUINTIS	Glyphosate 4L/ha
Planting sandalwood and STH	11/11/2021	QUINTIS	Planted with Pottiputki
Install tree guards	16/11/2021	QUINTIS	
Planting host species	Yet to be established at the time of writing		

The experiment will investigate 3 within-row spacing treatments. The treatments consist of the 2 treatments, specifically in R117 and will also include extra spacing treatment that was established within R116a.

A. Sandalwood planted at 2.4 m between individuals within the row, a stocking of 579 stems/ha.
B. Sandalwood planted at 3.9 m between individuals within the row, a stocking of 359 stems/ha.



- C. R116a - Sandalwood planted at 3.1 m between individuals within the row, a stocking of 448 stems/ha.

All seedlings were raised at Northern Tropical Plants nursery (NTP).

11. MANAGEMENT PROPOSALS

11.1 INFILL

The trial will have a survival assessment undertaken 2 months after establishment and any mortality will be replaced.

11.2 WEED CONTROL

All seedlings will have a tree guard installed after planting. Standard operational weed control procedures will apply. This will be Glufosinate applied at 4L/ha post-planting.

11.3 NUTRITION

The site will receive an application of MAP @300kg/ha applied in the 2nd year after establishment.

11.4 TREE STAND MANAGEMENT

11.4.1 SANDALWOOD

The sandalwood pruning regime is intensive, requiring multiple pruning events in the early years of the plantation. The timing of sandalwood pruning events is illustrated below.

Table 5: Proposed operations to be undertaken across planting over time.

Operation	Timing	Number of operations per annum
Tip prune	Year 1	1-2
Tip prune	Year 2	1-2
Form prune	Years 2-4	1-2
Epicormic prune	Years 5 – 15	1 (as required)

11.4.2 HOST MAINTENANCE

The long-term sandalwood hosts over time will achieve site capacity. At this point, plantation development will be slow and some trees will need to be selectively removed to maintain growth. This treatment may include some inferior sandalwood trees. Research is ongoing to better understand site capacity and the requirements for thinning.

The main objectives in host pruning are:

- Facilitate light reaching sandalwood trees and adjacent rows of LTH and maintain the desired form and growth of the host trees;
- Improve access to machinery.

11.5 PEST & DISEASE CONTROL

Standard QUINTIS P&D monitoring will occur.



12. MEASURES AND ASSESSMENTS

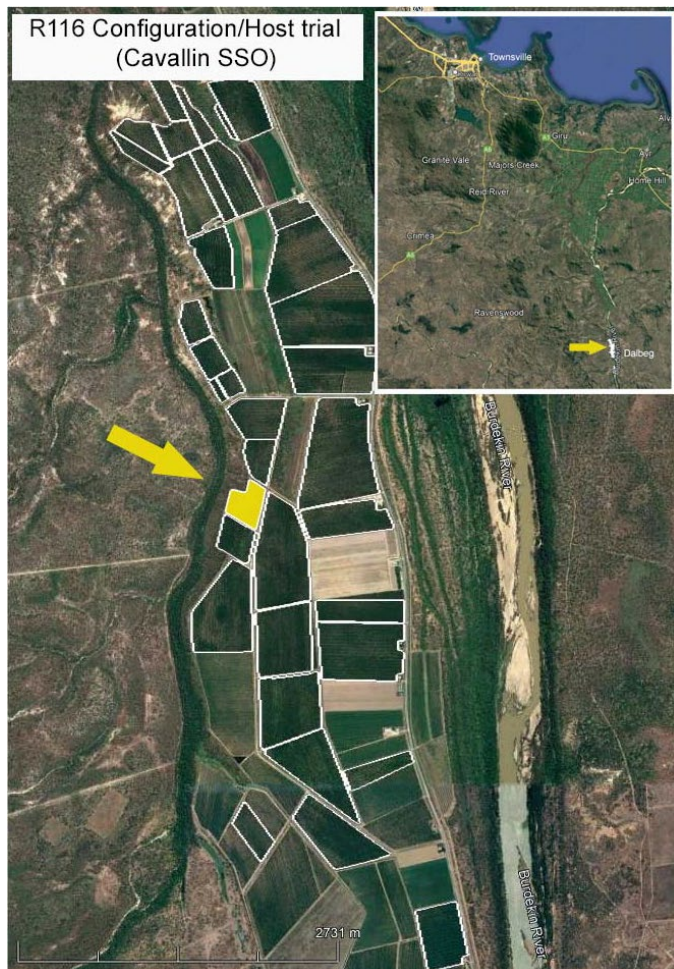
Standard assessments to be completed.

Table 6: Proposed assessment to be undertaken in the experiment.

	6 Months	1.5 years	2.5 years	3.5 years	5 years	7 years	10 years
Total height	X	X			X	X	X
DOB_20		X	X	X	X	X	X
DBH				X	X	X	X
Form Assess		X	X	X	X	X	X
Foliar sampling		X	X	X	X	X	X



APPENDIX A – SITE LOCATION DALBEG STAND 74



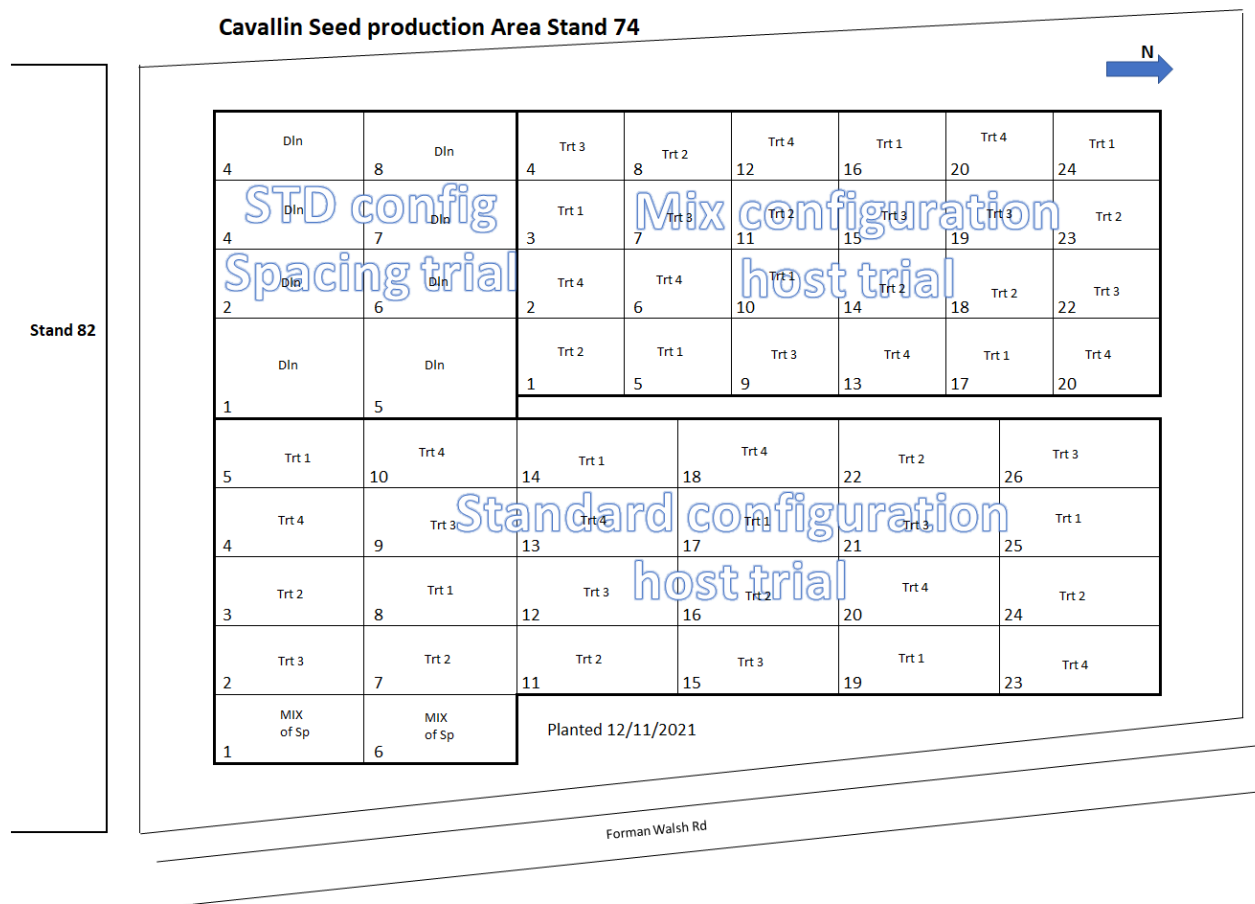


APPENDIX B – TRIAL LAYOUT

R116a – Standard Configuration host trial

R116b – Mix Configuration host trial

R117 – Standard Configuration spacing trial



Trt 1 D. lanceolaria
 Trt 2 D. latifolia
 Trt 3 C. unbellatum
 Trt 4 C. cunninghamiana