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HOW MUCH OIL DO I HAVE?

ABOUT THIS SERIES

This new series of fact sheets entitled "Oil Mallee Scientific Update" aims to disseminate some of the practical outcomes of the many research avenues currently pursued on oil mallees. It is intended that the topics be of relevance to growers, so that oil mallees may be grown across the state with the best possible information that is currently available. Topics for the future may include

- Carbon credits and oil mallees
- Harvest regimes to maximise long term oil production
- Beneficial and competitive interactions between oil mallees and adjacent crops
- To what extent do oil mallees control groundwater?
- New technologies in harvest and oil extraction.

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ABOUT THIS SHEET

This update describes a fast and accurate means for measuring the current yield of shoot material and eucalyptus oil for mallees plantings in the wheatbelt, for both uncut saplings and coppice regrowth. This is based primarily upon the dimensions of the canopy of leafy foliage on plants within in the stand under consideration. This is far more reliable than simply using plant age to predict yields.

Firstly, random selections of plants within the stand are measured for their canopy dimensions. This is used to give an estimation of the shoot biomass per plant using the appropriate equations in Table 2. Next, shoot biomass is converted to leaf biomass (using Table 3) and then to oil yield per plant (using Table 4). Finally, these numbers based on individual plants are scaled up to "per km of hedge".

TABLE 1. MALLEE OIL YIELD ESTIMATED BY CANOPY DIMENSIONS.

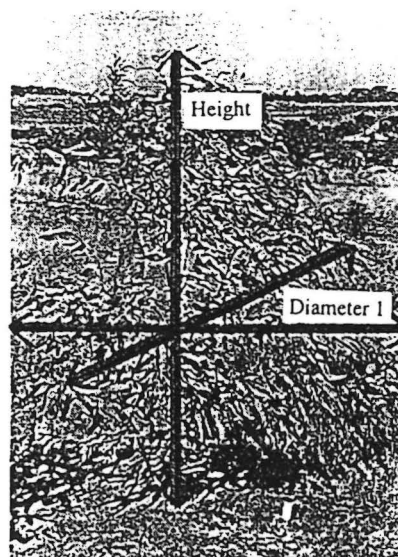
Examples of oil yield per km of hedge based on the average dimensions of the canopy of mallees in a stand. Dimensions are height x canopy diameter 1 x diameter 2 in metres. This assumes survival is a typical value of 90%

Species	1 x 1 x 1	2 x 1.5 x 1.5	4 x 2 x 2	6 x 3 x 3
<i>E. kochii</i> subsp. <i>plenissima</i>	39 kg	152 kg	270 kg	1270 kg
<i>E. horistes</i>	28 kg	106 kg	168 kg	773 kg
<i>E. loxophleba</i> subsp. <i>lissophloia</i>	25 kg	93 kg	148 kg	679 kg
<i>E. polybractea</i>	20 kg	77 kg	122 kg	561 kg

ESTIMATING STANDING SHOOT BIOMASS

For a stand of any size of a particular oil mallee species:

- ◆ Determine the number of trees planted per km of hedge and the survival percentage throughout the site.
- ◆ Measure the canopy dimensions of as many randomly selected trees throughout the stand as possible (at least 20 plants). It is important to measure trees across the greatest proportion of the stand as possible so that particularly good or poor sections do not wrongly influence the results. Dimensions to record (in metres) are height (H) and canopy diameters (D₁ and D₂). These measurements should include the extreme outermost leaf tips.



Measurements of oil mallees for biomass and oil yield calculations

- Note that height (H) refers to the canopy height, not the total tree height (but in most cases the canopy leaves go right to the ground). However, in cases where the lower section of the stem of an individual is devoid of leaves, this should be subtracted from the total height.
- Calculate average H, D1 and D2 for the site.
- Using Table 2, select the appropriate equation and calculate W, the average weight of fresh shoots on each plant in the stand.
- Shoot weight can be converted to leaf weight using the values in Table 3. Note that leaf percentage decreases as plants become larger. For example, plants calculated above to possess 20 kg of shoot would then contain $20 \times 45/100 = 9$ kg of leaf each.
- The yield of oil expected from each plant is then calculated using Table 4. For example, *E. horistes* mallees (which possesses 3.3% of leaf weight as oil) with 9 kg of leaf would yield $9 \times 3.3/100 = 0.3$ kg of oil.
- Finally, yields based on individual plants may be scaled up to 'per km of hedge' figures: Oil yield per km of hedge = oil yield per tree multiplied by the number of trees in 1 km of hedge, (which is calculated from the number planted and subsequent survival). For example, in a hedge of trees each currently containing 0.3 kg of oil, and planted in a typical planting density of 1330 trees per km with a 90% survival rate, oil yield per km of hedge = $0.3 \times 1330 \times 90/100 = 359$ kg.

TABLE 2. Equations for calculating current fresh shoot biomass per plant (W) for both uncut saplings and coppice regrowth.

Species	Equation	Approx. average prediction error
Saplings		
<i>E. kochii</i> subsp. <i>kochii</i> , <i>E. kochii</i> subsp. <i>plenissima</i> .	$W = 1.81 \times H \times D_1 \times D_2 + 0.097$	5 %
<i>E. horistes</i> , <i>E. angustissima</i> , <i>E. gratiae</i> , <i>E. loxophleba</i> subsp. <i>lissophloia</i> and <i>E. polybractea</i>	$W = 1.03 \times H \times D_1 \times D_2 + 0.261$	7 % ¹
Coppice		
<i>E. loxophleba</i> subsp. <i>lissophloia</i> , <i>E. gratiae</i> and <i>E. polybractea</i>	$W = 1.23 \times H \times (D_1 + D_2)/2$	4 %
<i>E. angustissima</i> , <i>E. horistes</i> , <i>E. kochii</i> subsp. <i>kochii</i> and <i>E. kochii</i> subsp. <i>plenissima</i> .	$W = 1.62 \times H \times (D_1 + D_2)/2$	5 %

¹As an example of error, this means that the true W is between W+7% and W-7% with 95% probability.

TABLE 3. Leaf percentage of shoot biomass changes according to total shoot weight.

Plant shoot weight	fresh	leaf percentage of shoot biomass
0.5 to 5 kg		55 %
5 to 15 kg		50 %
15 to 30 kg		45 % ²
30 to 100 kg		35 % ²

²data from Andrew McCarthy, 1998 Honours Thesis.

TABLE 4. Mallee oil abundance in leaves and the proportion of this oil which is cineole.

Species	Leaf % as oil	% of oil as cineole
<i>E. kochii</i> subsp. <i>kochii</i>	3.5 %	93%
<i>E. kochii</i> subsp. <i>plenissima</i>	3.1 %	92 %
<i>E. horistes</i>	3.3 %	90 %
<i>E. angustissima</i>	3.0 %	92 %
<i>E. gratiae</i>	2.7 %	65 %
<i>E. loxophleba</i> subsp. <i>lissophloia</i>	2.9 %	65 %
<i>E. polybractea</i>	2.4 %	87 %