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Effect of pruning age in two types of eucalyptus plants established in intercroped crop-livestock-forestry systems

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Introdução

The growing interest in the use of eucalyptus wood in sawmills has led the scientific investigation to study different methods to improve wood quality. In this sense, the adoption of silvicultural techniques such as artificial pruning and thinning, is extremely important to obtain timber quality and high value added (Chaves *et al.*, 2007).

The artificial pruning is a common silvicultural practice used in forest stands to produce high quality wood. It can be described as the removal of all branches to a predetermined height, resulting in a branch free stem up to this point (Springmann *et al.*, 2011). The wounds from pruned branches are confined to the central part of the stem, and then, the wood produced after the pruning is free from wounds (Finger *et al.*, 2001; Vale *et al.*, 2002; Polli *et al.*, 2006). On the other hand, pruning may benefit plant growth and its dendrometric characteristics (Finger *et al.*, 2001). It also has benefits to the understory growing pastures by reducing canopy closure (Fontan *et al.*, 2011).

Thus, pruning practices should adequate frequency, intensity and plant age, to promote, as fast as possible the healing of wounds without undermining both plant growth and stem form (Polli *et al.*, 2006). Pulrolnik *et al* (2005), have observed that intensity, frequency and pruning age can vary according to the genotype, site quality, plant age and plant vigor. Tree spacing may influence branch formation and senescence (Finger *et al.*, 2001).

In wide-spacing stands, such as found in intercropped crop-livestock-forestry systems, the increased availability of solar radiation favors the development of thicker branches (Vale *et al.*, 2002; Fontan *et al.*, 2011).

Few pruning studies have been undertaken for intercropped crop-livestock-forestry systems related to intensity, frequency and age of pruning (Vale *et al.*, 2002; Evangelista, 2007; Fontan *et al.*, 2011).

This study aimed to evaluate the effect of pruning age on the growth of two types of eucalyptus plants established in an intercropped crop-livestock-forestry system.

Material and methods

The study was carried out in a 5 hectare area located in Mar de Espanha, state of Minas Gerais, Brazil, planted in 2009. The trees were established in rows composed by two lines of trees spaced by 3 meters between lines and 2 meters between plants. Each row was spaced by 21 meters, totaling 416 trees per hectare.

It was used a completely randomized design with four replications in a factorial arrangement, with two factors: plant type (seed propagated material – SEED and vegetative propagated material – CLONE) and first pruning age (12 months – P12, 18 months – P18 and without pruning – WP). Each plot consisted of two rows of plants with a double border and 9 trees per row. The trees in P12 treatment were pruned at 1.5 meters height. At 18 months, all trees of both P12 and P18 treatments were pruned at 2.3 meters height.

The diameter at breast high (DBH) and total plant high (Ht) were measured from 12 to 30 months, each six months. After, the basal area per plant (BA) and the individual volume (IndVol) as well as its increases in the period (per month) were calculated.

These data were submitted to analysis of variance and the means were compared using the Scott- Knott test ($P<0.05$).

Results

There were no effects of the age of first pruning on the plant type for basal area and individual volume. The differences in basal area values, between CLONE and SEED, at 30 months of age, were higher in P18 (36.7%), followed by P12 (19.8%). There was no difference between CLONE and SEED in WP.

Differences in tree height and individual volume were observed in all pruning age treatments ($P<0,05$). Pruning trees at 12 months of age resulted in higher differences between CLONE and SEED (20.4%). However, differences in individual volume were higher when trees were first pruned at 18 months (52.9%) (Table 1).

Table 1 – Mean values for Basal Area (BA), Total Height (H) and Individual Volume (IndVol) of two eucalypts plant types at 30 months of age under different pruning ages.

Plant type	Pruning age (months)	BA (m^2.plant)	H (m)	IndVol (m^3.plant)
CLONE	WP	0,016710 b	16,9 a	0,132067 a
SEED	WP	0,014608 b	14,7 b	0,099271 b
CLONE	12	0,015010 a	18,3 a	0,125407 a
SEED	12	0,012532 b	15,2 b	0,089450 b
CLONE	18	0,017140 a	17,6 a	0,138209 a
SEED	18	0,012535 b	15,3 b	0,090372 b

Increase in basal area of cloned plants (CLONE) first pruned at 18 months was 34.8% higher than seed-propagated plants ($P<0.05$). No differences were observed for P12 and WP between plant types.

The age of first pruning affected the basal area increase only in seed propagated plants ($P<0.05$). Plants without pruning (WP) increased 18.2 and 20.1%, in basal area, than plants pruned at 18 and 12 months of age, respectively.

Height and volume increases were not affected by the age of first pruning. Cloned plants increased, in height, more than seed-propagated plants in P12 (19.2%) and P18 (10.5%). Volume increase differences between CLONE and SEED were higher in P18 (51.7%), followed by P12 (31%) and WP (39%) (Table 2).

Table 2 – Mean values for increase in Basal Area (BA), Total Height (H) and Individual Volume (IndVol) of two eucalypts plant types at 30 months of age under different pruning ages.

Plant type	Pruning age (months)	BA ($m^2.pl^{-1}.mth$)	H ($m\ pl^{-1}.mth$)	IndVol ($m^3\ pl^{-1}.mth$)
CLONE	WP	0,000755 a	0,550717 a	0,006767 a
SEED	WP	0,000676 a	0,499841 a	0,005166 b
CLONE	12	0,000659 a	0,613457 a	0,006378 a
SEED	12	0,000563 a	0,514690 b	0,004590 b
CLONE	18	0,000771 a	0,593375 a	0,007098 a
SEED	18	0,000572 b	0,536765 b	0,004678 b

Conclusions;

The age of fisrt pruning did not affect the growth of both plant types, suggesting that, it could be recommended pruning at 12 months in the sense to favor the increase in solar radiation to understory growing pasture;

There were differences between plant types, and cloned plants showed the best results.

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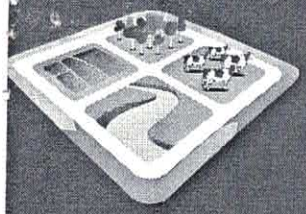

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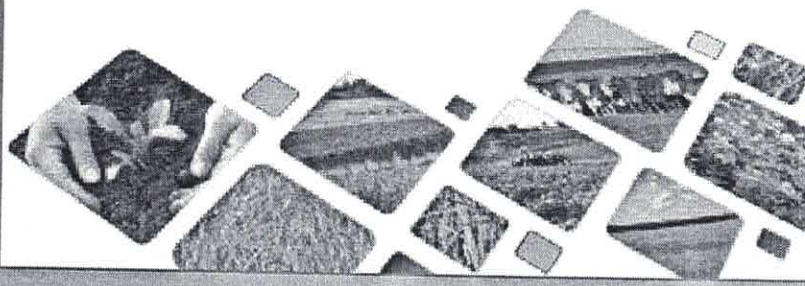

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