EUCALYPT RESPONSE TO NITROGEN FERTILIZATION – A CASE STUDY AT SOUTHERN PORTUGAL

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1. **Background and Objectives**: In most cases, Portuguese forest soils don't accomplish the nutritive requirements for *Eucalyptus globulus* Labill. full growth potential. Therefore, the complement with mineral fertilization, particularly phosphorous (P) and nitrogen (N), may allow performance gains and, consequently, an increment in wood for pulp and paper production. The main goal of this work was the evaluation of the response of eucalypt stands in southern Portugal edaphoclimatic conditions to maintenance fertilization, relating it with N uptake by plants.
2. **Material and Methods**: *Eucalyptus globulus* stands with 1.2 years (first rotation) in Relíquia, Odemira, southern Portugal, were considered for this study. Soils were classified as Cambisols (according to FAO, 2006) derived from schist bedrock. Soil samples collected within 40 cm of depth were sieved (<2mm) and texture, bulk density, water retention, pH, organic matter and total N were assessed. The trial was implemented in stands with a spacing plantation of 5.0x1.8 m (density of 1111 plants/ha). The study design included 4 treatments replicated in 3 different plots: control (no maintenance fertilization), N0 (0 kg N/ha), N1 (90 kg N/ha) and N2 (180 kg N/ha). Leaf sampling (12 subsamples per treatment) for N content determination by molecular absorption was carried out during the experiment. To determine N accumulation in the biomass and establish a nutrient balance (with primer focus to N content), 3 trees per treatment at 1.2, 3.4 and 9.7 years and litter at 9.7 years were collected and analysed. Different scenarios for harvesting: wood; wood+bark; wood+bark+60% of coppice were considered for the N mass balance analysis.
3. **Results**: Nitrogen fertilization represented at the end of rotation a mean tree income of 13% in volume (more 41.4 $m^3_{with\ bark}$ /ha/year in comparison to the control). Results showed a positive relation between maintenance fertilization and N foliar concentration, aerial biomass or N accumulation. This relation was more expressive during the early rotation stage. For instance, N accumulation for N2 treatment was more than 30 kg of N/ha comparing to N0 treatment at 3.4 years. At this age, more than 50% of N was allocated in coppice, while at 9.7 years, the wood presented about 56% of the total accumulated N (data related to the N2 treatment). Moreover, trees submitted to N2 treatment also presented, at 9.7 years, a higher accumulation of the other nutrients assessed. Nitrogen balance was affected by different harvest residue management scenarios considered (exportation of 79-132 kg N/ha for a 10 years cycle).
4. **Conclusions**: This study disclosed, as other studies, the need to fertilize eucalypts stands with nitrogen during maintenance stage. Fertilization also allows adopting more intense harvesting scenarios, minimizing nitrogen removal from ecosystem. Thus, nitrogen fertilization in eucalypt stands was positive to tree performance and the sustainability of this ecosystem.