

Effect of Soil Tillage on Diversity and Abundance of Macrofungi Associated with Chestnut Tree in the Northeast of Portugal



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Objectives

European chestnut tree (*Castanea sativa* Mill.) have a great economic interest for wood and fruit production in the northeast of Portugal. In order to maintain the soil free of weeds, traditionally, farmers practice several superficial tillages along the year. Phytosanitary problems mainly related with increasing *Phytophthora cinnamomi* contamination of soils are progressively changing these practices. In this context, the present work intend to evaluate the effect of two different soil management (tillage vs. non-tillage) of chestnut orchards on the macrofungi diversity and abundance.

Material and methods

During Autumn-Winter 2003, two neighbors *C. sativa* orchards were selected, one tilled and one non-tilled (Fig. 1), with more than 100 years old, located in Oleiros, near Bragança (Portugal).

In each orchard, five plots of 100 m² were delimited and weekly all mushrooms were harvested. The sporocarps were identified, counted, dried at 30°C for 72 h, and weighed. Taxonomic identification followed Moser (1983), Courtecuisse & Duhem (1995), Courtecuisse (1999), Bon (1988), Marchand (1971-86) and Bas *et al.* (1990-2001).

Representative voucher specimens were dried and deposited at herbarium of Escola Superior Agrária of Instituto Politécnico de Bragança.

Results

The diversity of macrofungi associated with *C. sativa* Mill. trees (tilled and non-tilled) is represented in fig. 2. In all plots 50 species, belonging to 20 genera were identified. In the tilled orchard 17 species from 12 genera were observed, mainly from the genera *Russula*. Non-tilled soil showed higher number of species (47) and genera (17). *Russula* was the most species-rich genera, with 11 species. Nine genera were common in the two soils management. *Amanita sp.*, *Mycena sp.* and *Xerula sp.* were only found in tilled soils and *Boletus sp.*, *Calocybe sp.*, *Cantharellus sp.*, *Hydnum sp.*, *Hypoholoma sp.*, *Leotia sp.*, *Lycoperdon sp.* and *Xerocomus sp.* in non tilled.



Fig. 1 - A) General view of *Castanea sativa* Mill. orchard (tilled- right and non-tilled- left). B) Some macrofungi.

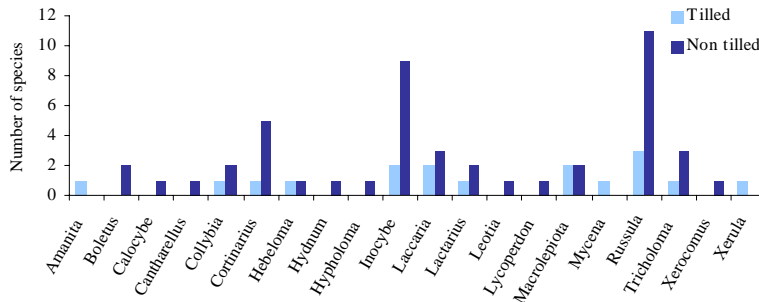


Fig. 2 - Macrofungi species distribution in *C. sativa* tilled and non-tilled orchards (Autumn-Winter 2003).

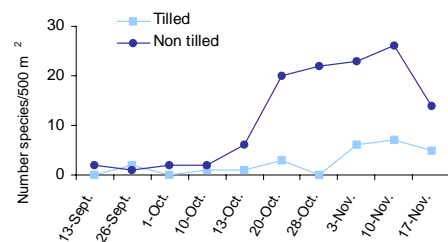


Fig. 3 - Total species number collected in 500m² of *C. sativa* Mill. orchard tilled and non-tilled.

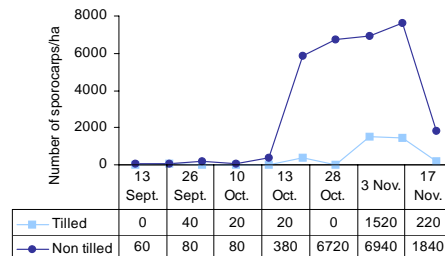


Fig. 4 - Number of total sporocarps per ha collected in *C. sativa* Mill. orchard tilled and non-tilled.

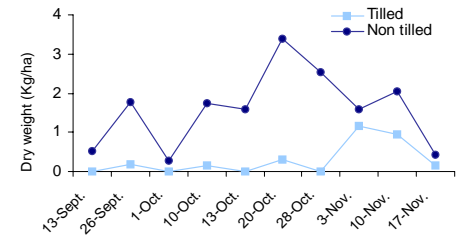


Fig. 5 - Dry weight (Kg/ha) of total sporocarps collected in *C. sativa* Mill. orchard tilled and non-tilled

Table 1 - Mean number \pm SE of total, nonmycorrhizal and mycorrhizal species, total dry weight and total number of sporocarps in *C. sativa* orchard tilled and non-tilled.

	Non tilled	Tilled	
N ^o of species (100 m ²)	Total	23.2 \pm 2.3	6.0 \pm 1.1 ***
	Nonmycorrhizal	3.6 \pm 0.6	1.4 \pm 0.6 *
	Mycorrhizal	19.6 \pm 1.7	4.6 \pm 0.6 ***
Dry weight (g/100 m ²)	155.8 \pm 29.2	28.5 \pm 4.3 **	
N ^o sporocarps (100 m ²)	297.0 \pm 61.2	35.0 \pm 19.9 **	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The total number of species found in non-tilled orchard were significantly greater than in tilled. This difference was more important for mycorrhizal species than for non-mycorrhizal (Table 1). From the total species collected in non-tilled orchard 83% were mycorrhizal and 17% non-mycorrhizal whereas in tilled soils 71% were mycorrhizal and 29% non-mycorrhizal.

The two *C. sativa* Mill. orchard showed a similar occurrence in number of fungal species along the harvesting season (Fig. 3).

The number of sporocarps was significantly higher in non-tilled orchard than in tilled one (Table 1). In the first type of management a total number of 29820 sporocarps were collected whereas in a tilled only 3660 sporocarps were observed. With regard to occurrence, we observed that the greatest number of sporocarps occurred in an identical period as the number of species (Fig. 4).

Sporocarp production (dry weight) was significantly greater in non-tilled than in tilled (Table 1). At the end of the harvesting season, 15.9 Kg dw/ha was collected from non-tillage orchard and 2.9 Kg dw/ha was from tillage. The evolution of biomass production, along time, changed according the soil management (Fig. 5).

Conclusions

- This study has demonstrated that *C. sativa* Mill. orchard provide a habitat for diverse macrofungal communities.
- The number of species, sporocarps and biomass production increased in non-tilled *C. sativa* Mill. orchard and decreased considerably in tilled soil. These changes were found to be statistically significant, especially for mycorrhizal species.