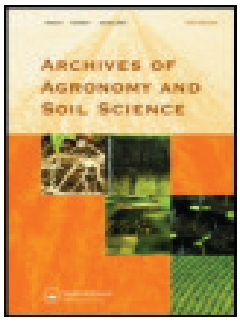

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Carbon and nitrogen mineralisation from green manures as alternative nitrogen sources in Mediterranean farming

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ABSTRACT

The soil incorporation of green manures is a practice that can be used in sustainable agriculture and in organic farming, where nitrogen (N) sources are limited. The aim of this study was to evaluate balansa clover (*Trifolium michelianum* Savi), yellow lupine (*Lupinus luteus* L.) and ryegrass (*Lolium multiflorum* Lam.) as potential alternative N sources. A total of nine treatments were considered in this study: control, aerial of balansa clover, roots of balansa clover, aerial of yellow lupine, roots of yellow lupine, aerial of ryegrass, roots of ryegrass, mixture aerial + roots of yellow lupine and mixture aerial + roots of ryegrass. A laboratory incubation experiment was conducted under controlled conditions during 196 days and carbon and N mineralisation were followed. Results showed that green manures are appropriate N sources for Mediterranean farming. No significant differences in terms of N mineralisation were observed between aerial or roots biomass of the green manures. Besides, 37–55% of total N applied was mineralised in treatments amended with balansa clover or yellow lupine, whereas 13–21% of total N applied was mineralised in ryegrass. It can be concluded that the most efficient green manure for supplying mineral N to the succeeding crop was yellow lupine.

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KEYWORDS
Balansa clover; CO_2–C flux; crop residues; nitrogen availability; ryegrass; yellow lupine

Introduction

In Mediterranean farming, leguminous crops can fix atmospheric nitrogen (N) symbiotically and supply N to the subsequent crops, when these crops are included in rotations during autumn–winter months (Jacobsen et al. 2012; Dalias 2015). Moreover, legumes contribute to improve soil organic matter content, soil structure and availability of soil phosphorus (Preissel et al. 2015).

The incorporation of legumes as green manures into the soil is a technique that can be used in sustainable agriculture and in organic farming, where N sources are scarce (Arrobas et al. 2016; Perdigão et al. 2012). In addition, when legumes are used as a break crop in rotations dominated by grasses (cereals) or plants from other botanical families, they play an important role in the pest and diseases suppression by interruption of life cycles of plant enemies (Fan et al. 2006).

Previous studies (Arrobas et al. 2016; Frankenberger Abdelmagid 1985; Nakhone & Tabatabai 2008; Justes et al. 2009; Perdigão et al. 2012; Carranca et al. 2015) reported a high potential of legumes for supplying mineral N throughout mineralisation to the subsequent crop. However,

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