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Effects of olive mill wastes added to olive grove soils on erosion and soil properties

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INTRODUCTION

The increasing degradation of olive groves by effect of organic matter losses derived from intensive agricultural practices has promoted the use (by olive farmers) of olive mill wastes (olive leaves and alperujo) which contain large amounts of organic matter and are free of heavy metals and pathogenic microorganisms. In this work we compared the effects of these oil mill wastes on the decrease of soil erosion, also, we undertook the assessment of the organic carbon and nitrogen contents of soil, their distribution across the profile, the accumulation and Stratification ratios (SRs) of soil organic carbon (SOC) and total nitrogen (TN), and the C:N ratio, in Cambisols in Mediterranean olive groves treated with olive leaves and alperujo.

MATERIALS AND METHODS

The study area was a typical olive grove in southern Spain under conventional tillage (CT). Three plots were established. The first one was the control plot; the second one was treated with olive leaves (CTol) and the third one, with alperujo (CTa). 9 samples per plot were collected to examine the response of the soil 3 years after application of the wastes. Soil properties determined were: soil particle size, pH, bulk density, the available water capacity, SOC, TN and C:N ratio. SOC and N stock, expressed for a specific depth in Mg ha-1. Stratification ratios (SRs) (that can be used as an indicator of dynamic soil quality) for SOC and TN at three different depths were calculated. The erosion study was based on simulations of rain; that have been carried out in order to highlight differences in the phenomena of runoff and soil losses in the three plots considered. The effect of different treatments on soil properties was analyzed using a ANOVA, followed by an Anderson–Darling test.

RESULTS

Supplying the soil with the wastes significantly improved physical and chemical properties in the studied soils with respect to the control. C and N stocks increased, the SOC stock was 75.4 Mg ha–1 in CT, 91.5 Mg ha–1 in CTa and 136.3 Mg ha–1 in CTol; and the TN stock 12.1, 13.9 and 16.1 Mg ha–1 in CT, CTa and CTol, respectively. In addition, both oil mill wastes contributed to delay runoff generation and erosion, enhancing the infiltration of rainwater. Furthermore, application of the wastes improved soil quality (SRs of SOC were greater than 2). So the addition of these oil mill wastes to agricultural soils has become a viable solution to their disposal; not only do they enrich deficient soils with organic matter, but also improve their physical and chemical properties, even decrease soil erosion, especially olive leaves.

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