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A LONG-TERM EXPERIMENT ON OLIVE TREE WITH NITROGEN, PHOSPHORUS AND LIMESTONE FERTILIZATION

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Abstract:
In Portugal, a great number of olive groves are located on acid soils, with low levels of organic matter and nutrients, in particular phosphorus. In a mature olive grove, cultivar 'Verdeal Transmontana', located in Mirandela, in the Portuguese region of Trás-os-Montes, a field experiment was established in order to evaluate the effect of N, P and limestone applications on the yield and some quality parameters of olive oil. The experiment, installed on a Cambisol, was arranged into a randomized complete blocks design with three replications and eight experimental treatments resulting from a factorial design with 2^3 combinations of two levels of each factor. The limestone was applied only in the first experimental year (10,000 kg ha^{-1}) and P was applied annually, from 1987 to 1994 (0 and 34 kg ha^{-1} P). Nitrogen was applied annually at 94 and 188 kg ha^{-1} N from 1987 to 1994, changing to 0 and 78 kg ha^{-1} N from 1995 to 2006. In this last period, only the residual effect of limestone and P was evaluated. Experimental results obtained from 1995 to 2006 show an increase on fruit-yield due to N and limestone applications, respectively 35% and 18% as compared with the control. Fruit-mean weight and fruit-fat content, as well as the quality parameters of olive oil (acidity, peroxide value, specific absorbance coefficients K_{232} and K_{270}, total polyphenols, waxes and total sterols), were not significantly affected ($p>0.05$) by fertilization. In contrast, oxidative stability of olive oil increased with P application. In acid soils with low levels of organic matter it is advantageous to apply limestone and N as it results in higher fruit-yield, without affecting olive oil quality.