NITROGEN FERTILIZER RECOMENDATIONS: COMPARISON BETWEEN NITROGEN BALANCE OF FRENCH AND STANFORD METHOD ON A BARLEY CROP UNDER ZERO TILLAGE IN CHILEAN VOLCANIC SOILS

Francisco Matus B.[(1)], Juan P. Mellado V.[(1)] y Rodrigo Cazanga S.[(2)]

[1.] Centro Tecnológico de Suelos y Cultivos, Facultad de Ciencias Agrarias, Universidad de Talca. Casilla 747, Talca, Chile. (matus@utalca.cl)
[2.] Facultad de Ciencias Agropecuarias, Universidad Mayor, Av. Américo Vespucio Sur 357, Santiago, Chile. (rcazanga@yahoo.com)

ABSTRACT

Nitrogen (N)-fertilizer recommendation can be calculated from the N balance method (denoted hereafter as French method) by the difference between N-input and N-output, but mineral soil N is required at rooting depth in spring. N-fertilizer can also be estimated from the difference between crop N demand and soil N supply using the apparent recovery efficiency of N-fertilizer (N_{REC}). Henceforth Stanford method. N_{REC}, i.e. the fractional amount of N derived from fertilizer taken up by a crop, has been used as a linear response-and-plateau (LRP) based on Liebig's Law. So, the amount of N not recovered, i.e., the N unaccounted for is proportional to the amount of N-fertilizer added until the plateau is reached. Soil N unaccounted for is assumed to remain as residual mineral N, immobilized as organic N in the microbial biomass, fixed into the newly formed root and lost by leaching and gas emissions into the atmosphere. The fact that residual soil N from the French method may be measured by soil analysis, raises the question whether the two approaches are comparable. Here, the hypothesis was tested that N unaccounted derived from N balance is equivalent to the same amount of N derived from N_{REC}. Nitrogen balance was achieved by sampling residual mineral soil N up to 60 cm depth at sowing and harvest time of a barley crop under zero tillage. N unaccounted for from N balance and from N_{REC} were compared on 1:1 plot. The results showed a close linear relationship between the two methods. Thus, the slope and intercept were not different from 1:1 line. Furthermore, the amount of N not recovered by crops was proportional to the quantity of N-fertilizer added. The results supported the concept of LRP on cereal crops. The advantage to use N_{REC} instead of N balance is that the former does not require soil analysis, but N_{REC} depends on climatic conditions.

KEY WORDS: fertilizer recommendation, nitrogen balance.