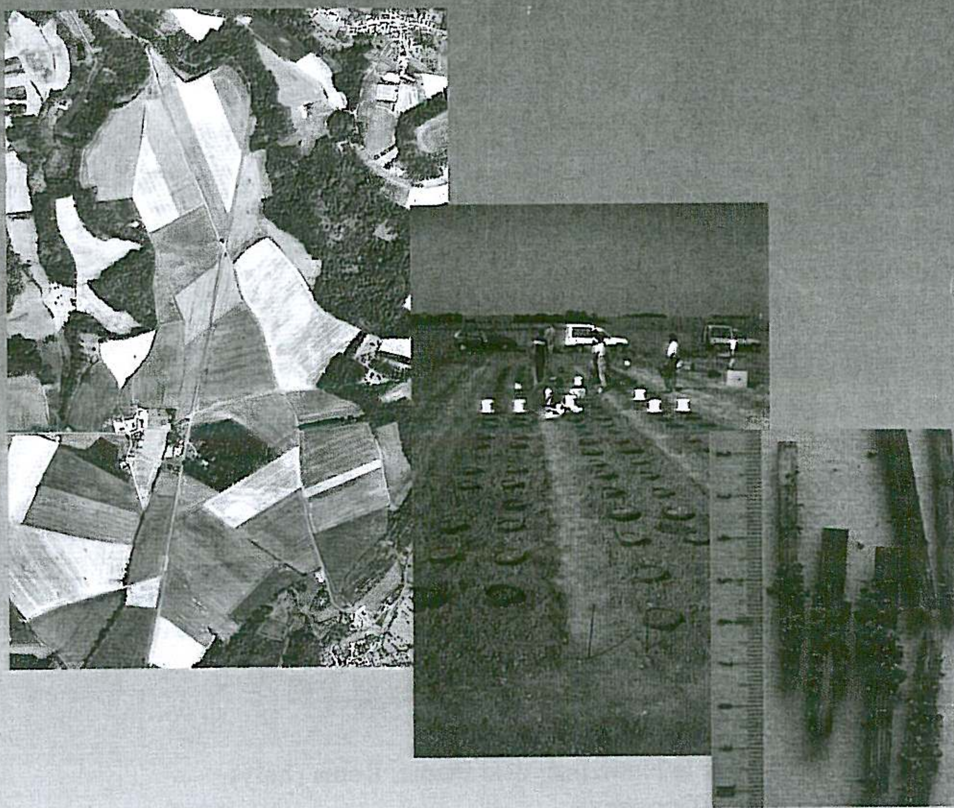
11th Nitrogen Workshop

11ème Atelier sur l'azote

Book of Abstracts

Recueil des Résumés



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Nitrogen management in the potato crop: characterization of nitrogen nutritional status indices

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Introduction

Fertilizer-N recommendation systems have been permanently under discussion all around the world, due to the ecological significance of N and the difficulty in making fertilizer recommendations for this element before the start of the growing season. Several researchers have suggested alternative action proposals that consist of the preplant application of a small proportion of the total necessary N, with fertilization adjustments at sidedressing time, based on indices of the N nutritional status of the crops. In this abstract, results to do with the sensitivity of the petiole nitrate, leaf N and leaf greenness indices in relation to soil N availability are presented.

Material and methods

The field trials were carried out at Bragança (NE Portugal) over four years (1996-1999), on a loamy eutric cambisol. The climate is Mediterranean type, dry and warm in the Summer. The experimental set up was organized in a split-plot design. The preplant treatments were 0 (P0), 50 (P50), 100 (P100), 200 (P200) and 300 (P300) kg N ha^{-1}, included as main plots. In sidedress (as sub-plots) 0 (S0), 25 (S25), 50 (S50), 100 (S100) and 200 (S200) kg N ha^{-1} were applied, 19 days after emergence. The sidedresses of 1999 consisted only of one N rate (200 kg N ha^{-1}), but applied at different times during the cultural cycle (in the control no N fertilizer was applied). As N fertilizer urea was used. Nitrogen nutritional indices were determined on the fourth leaf from the top. Leaf (blade + petiole) N was determined by the Kjeldahl method. Petiole nitrates were analysed by spectrophotometry in a segmented flow analyser. Leaf greenness was evaluated in the terminal leaflet with the SPAD-502 chlorophyll meter.

Results and discussion

Some of the obtained results are presented in figures 1, 2 and 3.

The nitrate content reached in the S0 treatments (figures 1: P0, P100 and P200) was dependent of the preplant N applied. After the sidedress N applications the achieved nitrate content, in each preplant fertilizer treatment, depended on the sidedress N rate. The results show that the levels of petiole nitrates are sensitive to the applied N independently of the application time. The leaf N followed an identical pattern to the petiole nitrates (figure 2), although with less variation amplitude, showing just as great sensitivity to the soil N availability. On the other hand, the values never approach zero, for the reason that, whereas the nitrates are exclusively a form of reserve, part of the leaf N is integrated into vital organic structures (Barraclough, 1993; Millard e Mackerron, 1986). After the sidedress fertilizer application, the SPAD-values rised rapidly and reached, always, the greatest values registered in each growth stage (figure 3). The results also show that the greenness of the leaves react to the applied N with great sensitivity, contrary to what was observed by Vos and Bom (1993).

Conclusion

All the indices can be considered good N nutritional indices, in so far as they presented good sensitivity to soil N availability. The difficulty in the generalization of these methodogies is due to the natural variation associated with the indices, because of ontogenetic effects and genetic, environmental and cultural factors. The minimization of these effects is crucial to validate these techniques of diagnosis and recommendation of fertilizer use.

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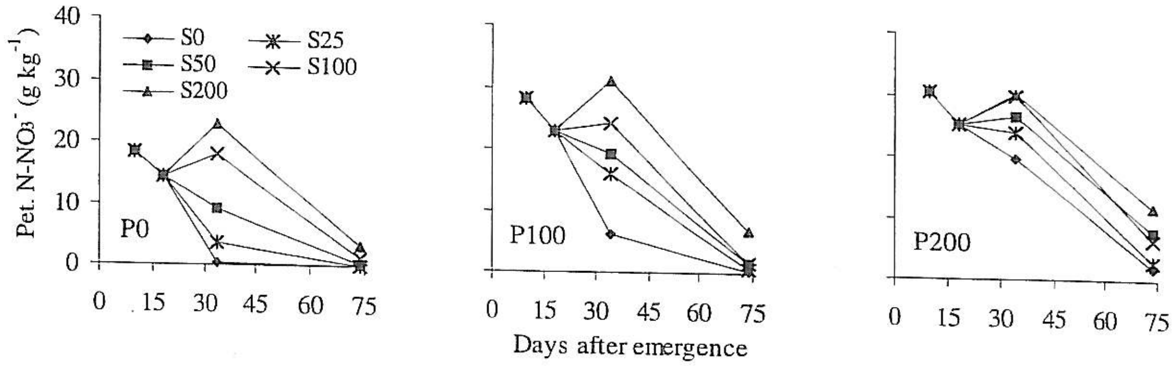

Figure 1 –Effect of preplant and sidedress N application on petiole nitrate concentration.

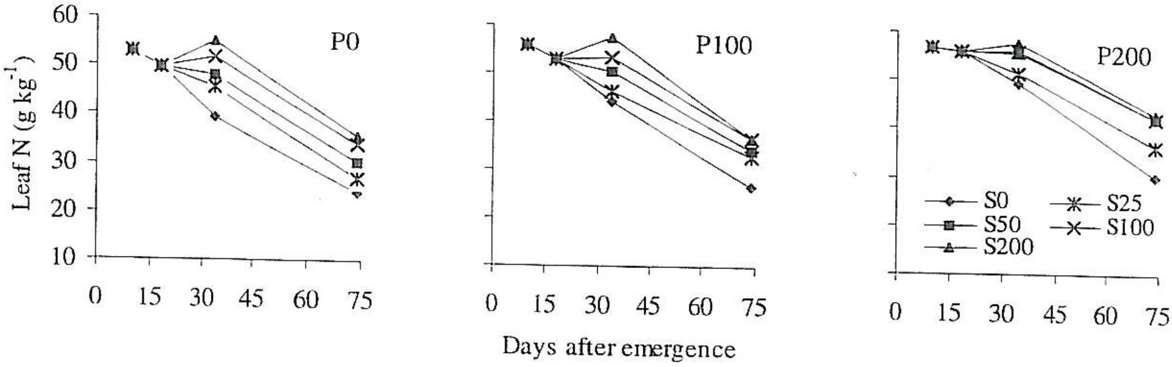

Figure 2 –Effect of preplant and sidedress N application on leaf N concentration.

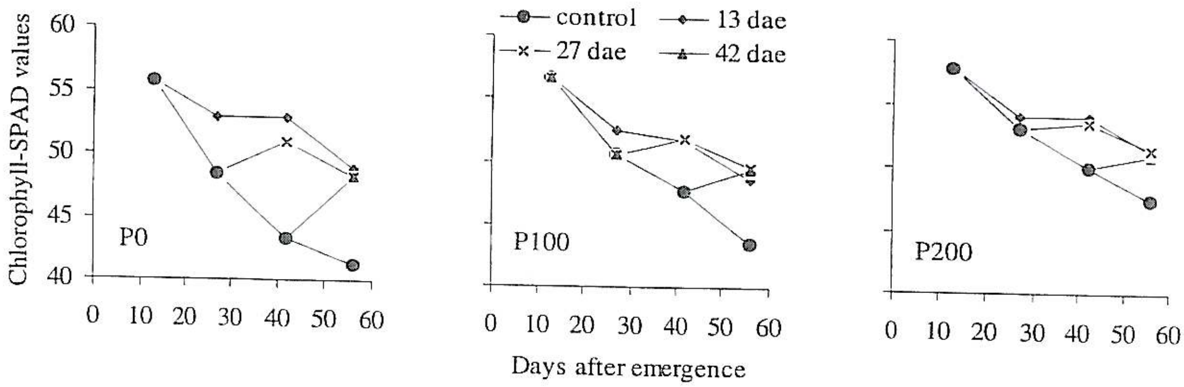

Figure 3 –Effect of preplant and time of sidedress N application on chlorophyll-SPAD values.