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"Solidarity in a competing world — fair use of resources"

Analysis of N Use Efficiency of Maize to Optimise N Fertiliser Application under Weed Competition

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Abstract

Analysis of nitrogen (N) use efficiency of maize plants may enhance the understanding of the mechanisms governing the N status of maize under weed competition and thus will help with the optimisation of N fertiliser application. The goal of this study was to optimise N fertiliser application rate in maize under weed-free and weed-infested conditions in order to minimise the overuse of N in maize agroecosystems. In this study experiments were conducted in 2008 and 2009 at the experimental field of Tarbiat Modares University, in Iran, in which maize cv. OSSK 602 competed with two different weed species at two densities and under different N fertiliser levels. The experimental levels included N fertiliser rates at 138, 184 and 230 kg N ha^{-1}), two weed species (proso-millet and redroot pigweed), and low and high densities of each weed species. Low and high densities of proso-millet were 7.5 and 37.5 plants m^{-2} while for redroot pigweed they were 5 and 25 plants m^{-2}. Proso-millet was less responsive to the application of N fertiliser compared to the redroot pigweed. Competition with weeds significantly reduced maize grain yield, total biomass and N use efficiency (NUE). At high densities of both proso-millet and redroot pigweed an increase in the N application from 138 and 230 kg N ha^{-1} reduced maize grain yield, N content, and NUE from 44 % to 52 %. It was found that maize was more sensitive to nitrogen uptake efficiency (NUpE; the ratio between N taken up by the crop to the soil N at planting) than nitrogen utilisation efficiency (NUtE; the ratio between grain N content to the total plant N) so that weed competition mainly affected maize NUE through reducing its NUpE component (up to about 43 %). The greater role of NUpE on NUE may suggest a more important role of below-ground competition in weed-infested maize fields compared to above-ground competition.

Keywords: Biomass N, grain N, nitrogen uptake efficiency, nitrogen utilisation efficiency, proso-millet, redroot pigweed

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