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BIOLOGICAL NITRIFICATION INHIBITION (BNI) - A NOVEL APPROACH FOR ENHANCING NITROGEN-USE EFFICIENCY (NUE) IN CROPS AND PASTURES

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While the Green Revolution has doubled global food production between 1960 and 2000, in the same period, global N-fertilizer consumption has also increased 12-fold (from 10Tg N to 120 Tg N yr⁻¹). Significant environmental impacts have resulted from this large-scale injection of industrially-fixed-N into agricultural systems as manufacturing N-fertilizer is energy-intensive, and fertilizer-use efficiency is low for N (NUE <30% at present), led to massive N-leakage into the larger environment. Nitrification, a soil-biological process, converts the immobile-NH₄⁺ into a mobile-NO₃⁻, highly susceptible to leaching and denitrification (causing gaseous-N-emissions, N₂O and NO). Modern agricultural systems have become high-nitrifying; nearly 95% of the fertilizer-N that enters these agricultural systems goes through rapid nitrification and NO₃⁻ has become the dominant inorganic-N source for crop uptake and assimilation. Such NO₃⁻-dominated crop nutrition is the inherent reason for low-NUE in the present production systems. Suppressing soil-nitrifier-activity is thus central to retain soil-N, and to improve NUE. Biological nitrification inhibition (BNI) is the ability of certain plant root systems to suppress soil nitrification by releasing nitrification inhibitors. The last 15-years of research at JIRCAS with collaborative partners (CIAT, CIMMYT and ICRISAT) suggests the existence of variation in the BNI-capacity of some staple-food-crops (sorghum and wheat) and feed/forage (e.g. *Brachiaria* grasses), which can be genetically exploited in breeding programs to develop BNI-enabled N-efficient varieties in the near future. The strength of BNI-function expressed under field-environments and the possibility of exploiting such BNI-enabled varieties to develop low-nitrifying, low-N₂O emitting, next-generation novel crop-livestock production systems with significantly higher NUE, thus can be more productive and sustainable - will be the theme of this keynote-talk.

Key-words: BNI, *Brachiaria*, NUE, sorghum, wheat

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Promoção



Realização

