Effects of Commercial Chemical Products on Maize Yield in Different Agro-Ecological Zones in Kenya

Author: Munyahali, Zirhahwakuhingwa Wivine

Abstract:

Crop production in Central and Western Kenya is mainly restricted by nitrogen (N) and phosphorus (P) deficiency and limited investment capacity in Nand P inputs by smallholder farmers. Nutrient inputs to the soil are often utili sed inefficiently due to environmental factors, soil related factors (e.g., P fixation by sesquioxides) and management factors. Integrated soil fertility management (lSFM) practices aim at maximizing the use efficiency of applied nutrients. This study sought to test the efficacy of manufactured chemical products that may be used as fertilizers in different agro-ecological zones in Kenya. Such products included seed P coatings, foliar application with P and micronutrients and urease/nitrase inhibitors that slow N release. Experiments with alternative P formulations were carried under greenhouse conditions (Accele-grow, Agroleaf HP, Aton AZ, Broadacre, Myconate, Teprosyn Zn/P, Turbo-seed Zn and Turbo-top) using a randomized complete block design (RCBD) and also in multi-locational field trials with farmer groups in Bondo and Meru South districts in Kenya in two consecutive seasons. The products (Agroleaf HP, Teprosyn ZnIP and Turbo-top) were applied in combination with triple super phosphate (TSP) fertilizer at 13 kg P ha', as the P supplied through the products was assumed insufficient to attain adequate crop yields. Response to P was assessed by including treatments ~lth P addition at 0, 13 and 26 kg P ha-1 . The N inhibitor products (Agrotain and Super U) were evaluated only under field conditions in a multi-locational trial where a farmer group equalled to one replicate in Meru South district during two consecutive seasons. Response to N was evaluated by including treatments with N in form of urea at 0 and 46 kg N ha-'. In the greenhouse trial, none of the products significantly (P<O.05) increased the shoot dry matter yield of 6-weeks old maize. However, maize had higher root biomass when Teprosyn, a seed P coating product, was applied. In the field trials, a significant response to TSP fertilizer on maize grain and stover yields was."Observed in Bondo, but not beyond 13 kg P ha-'. None of the treatments with the different products significantly increased grain yield. However, significant (P<0.05) positive correlations were observed when grain yield increase due to application of Teprosyn ZnIP or Agroleafhigh P (in combination with TSP at 13 kg P ha") was plotted against the difference in grain yield obtained with TSP applied at 26 and 13 kg P ha-'. This suggests that these products only increase yields in the most P-deficient soils with a significant response to fertilizer beyond 13 kg P ha-1 • Application of Agroleaf and Teprosyn resulted in an increase in additional net benefit of 52 and 165 USD ha-', respectively in Bondo during the second season. However, Teprosyn was the only profitable product as it resulted in a benefit-cost ratio of 15 with a marginal rate of return (MRR) of 14 (relative to the treatment with sole P applied at 13 kg P ha-'). None of the N inhibitor products applied significantly increased grain yield in the two seasons. The mode of application of urea and products did not have any effect on maize grain and total biomass yields. Teprosyn is the most profitable product of the P-based products evaluated under field conditions, as it resulted in profitable yield increases. The profitability of Teprosyn was, however, likely related to its low purchasing price and its low labour cost rather than yield increment.