

Research Application Summary

**Effects of agricultural commercial products (microbial and non microbial) in relation to maize and soybean yields in western Kenya**

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**Abstract**

This study was undertaken to assess the effect of different inoculants on nodule formation and legume yield. On farm experiments were carried out in Bungoma district of western Kenya with treatments arranged in RCBD design with single replicate per field in six sites. Inoculated soybean and maize seeds with various commercial products were planted in plots of 4.5 x 5.0m and 0 levels, 13 kg P/ha, 26 kg P/ha, and 60 kg N/ha were applied to different treatments. Plants were sampled at different growing stages where plant height measurements, biomass and nodule numbers were recorded. Maize ear leaf sampling took place at 50 % podding in soybean. The rhizobial products (Histic and Legumefix) gave better performance than other biomasses in terms of number and size of nodules and pods. There is a potential to up-scale the use of effective bio-products to improve nitrogen fixation and improve legume yield.

Key words: Histic, legume fix, nodules, seed inoculation, western Kenya

**Résumé**

Cette étude a été menée afin d'évaluer l'effet des différents inoculants sur la formation de nodules et le rendement des légumineuses. Des expériences de la ferme ont été effectuées dans le district de Bungoma à l'ouest du Kenya avec des traitements disposés dans la conception des RCBD Fisher avec répliquer unique par domaine dans six sites. Les graines de soja et de maïs inoculés avec différents produits commerciaux ont été plantés dans des parcelles de 4,5 x 5,0 m et de niveaux 0, 13 kg P/ ha, 26 kg P/ ha, et 60 kg N/ ha ont été appliqués à différents traitements. Les plantes ont été échantillonnées à différents stades de croissance où les mesures de la hauteur des plantes, de la biomasse et le nombre de nodules ont été enregistrées. L'échantillonnage des épis de feuille de a eu lieu à la formation des gousses de 50% dans le soya. Les produits Rhizobium (histique et Legumefix) a donné de meilleures performances que les autres biomasses en termes de nombre et la taille des nodules et des gousses. Il y a potentialité de mettre à l'échelle l'utilisation efficace des produits biologiques

pour améliorer la fixation de l'azote et le rendement des légumineuses.

Mots clés: Histique, fixer des légumineuses, nodules, l'inoculation des semences, l'ouest du Kenya

## Background

Food insecurity in Sub Saharan African (SSA) has increased exponentially over the past several decades, and there is seemingly no nearby end to this food crisis. This is partly due to low crop productivity from the soil nutrient depleted soils. Nitrogen and Phosphorous in the region are widely deficient primarily as a result from either low levels of soil P or depletion, while N is extricable linked to the amount and nature of soil organic matter (SOM)(Giller *et al.*,1997). Technologies to overcome these nutrient deficiencies include use of inorganic fertilizers and organic sources, however these are too expensive for smallholder farmers in the region.

Technology breakthroughs in soil fertility management have proven that some commercial inoculants (e.g rhizobial and mycorrhizal inoculants) enhance the productivity of specific legumes (Giller *et al.*,1997). Agricultural research institutes have indeed done much on inoculation as a way of improving crop productivity. Biological Nitrogen Fixation (BNF) constitutes an efficient biological way of managing soil fertility, thus offering an economically and ecologically sound means of reducing external inputs and improving internal resources. This study was undertaken to enhance the awareness of using commercial inoculants on maize and soybeans in relation to yield, with the hope that this would improve N and P levels in the soils of Western Kenya.

## Literature Summary

Soil fertility constraint has been treated as the major biophysical factor causing declining crop yields (Sanchez *et al.*, 1997). Improving N and P in such soils is capital investment, but ultimately, the question of how best to utilize the crop land must be answered. In this regard use of commercial products has to be adopted to address soil nutrient deficiencies.

Biological nitrogen fixation (BNF) by legumes is of considerable importance in the maintenance of soil fertility especially in cereal-legume-based cropping systems. This is particularly so in developing countries where commercial nitrogen fertilizers may not be available, or if available, may be too expensive for majority of the farmers. Well planned cropping systems, which

## Study Description

include legumes, are therefore essential to supply nitrogen needed for the growth of non-legumes (Giller and Wilson, 1991).

On-farm experiments were carried out in Bungoma district of western Kenya, during the 2010 long rains growing period. The altitude ranges between 1200 above the sea level, and the area receives an average rainfall of 1250-1800 mm per year. The pH values ranged from 4.2 -6.3 across the sites. Treatments were arranged in RCBD design with single replicate per field in six sites (multi-location design). Inoculated soybean and maize seeds were planted in 21 plots per site of 4.5 x 5.0m and 0 levels, 13 kg/ha, 26 kg of P/ha, and 60 kg N/ha were applied to different treatments. Initial soil samples were taken at a depth of 0-15cm for % Organic carbon, total N, Olsen P, soil texture and pH determination. Plants were sampled at different growing stages; height measurements, biomass and nodule assessment together with maize ear leaf sampling took place at 50% podding and lobing in soybean and in maize, respectively.

## Research Application

From the nodule assessment results, the rhizobial products were observed to perform better than the mycorrhizal products, i.e., in terms of number and size of nodules and pods, Histik and Legume fix (treatment 9 and 5) performed best. This implied that there was effective nodule formation in the soils that received those products. Treatment 1 (no N, no P) and treatment 3 (60 kg N/ha and 26 kg P/ha applied) had the least number of nodules which were also smaller in size.

## Acknowledgement

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