

Does sugarcane bagasse ash modify soybean morphology and nutrient allocation?

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After extraction of sugarcane juice, the remaining fibrous material, so-called bagasse, is burned for energy production, resulting in bagasse ash. Bagasse ash is poor in nitrogen (N) but still contains varying amounts of other plant nutrients, including phosphorus (P) and potassium (K). In between sugarcane rotations, N-fixing cover-crops like soybeans are planted to increase soil N-content. Since soybean does not rely on mineral N, pure bagasse ash has the potential of serving as a fertilizer. Here we study the bagasse ash effects on soybean growth, morphology, and NPK-allocations within the plant.

In our analyses soybeans inoculated with N-fixing *Rhizobia* were cultivated under greenhouse conditions for 56 days. Nutrient poor substrates were homogeneously mixed with eight doses of P (0-70 mg/L) and K (0-375 mg/L) in form of bagasse ash, and in form of triple-superphosphate and potassium sulphate, respectively. After harvesting, soybean biomass was determined and stems, petioles, leaflets, pods, roots and nodules were analysed with regard to morphology and N-, P- and K-concentrations.

Soybeans treated with bagasse ash accumulated and recovered significantly less biomass and nutrients than soybeans treated with traditional fertilizers. Leaf and root morphologies significantly altered in favour of leaf area increase and root proliferation, while the stem, pods and nodule morphologies were less affected by the ash. The N-, P- and K-concentrations depended on nutrient, nutrient availability and soybean organ.

Our results demonstrate the potential of bagasse ash as a fertilizer for soybeans and subsequent nutrient distribution. The latter can be helpful for using biomass of bagasse ash treated soybeans as a green fertilizer.

Open question is if modifications of bagasse with other nutrient rich residues and modification of burning conditions increase the bagasse ash nutrient concentration and improve nutrient availability to soybeans.