Research Application Summary

Evaluating the macropropagation efficiency of banana varieties preferred by farmers in Eastern and Central Kenya

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Abstract

Kenyan farmers are threatened by overreliance on few crops whose yields are reduced by adverse climatic changes. Bananas are more resilient and produce year round, making it a more suitable crop. To increase banana production, farmers should be enabled to access affordable high quality seedlings. Currently, farmers rely on natural regeneration which is inefficient and a potential source of pests. Macropropagation is an alternative propagation method that can supply affordable seedlings. In this study, macropropagation efficiency of farmer preferred banana varieties will be determined with respect to their agro ecological zones.

Key words: Agro-ecology, banana, macropropagation, varieties

Résumé

Les agriculteurs du Kenya sont menacés par la dépendance excessive sur les rares cultures dont les rendements sont réduits par des changements climatiques néfastes. Les bananiers sont plus résistants et produisent toute l'année, ce qui en fait une culture plus appropriée. Pour augmenter la production de la banane, les agriculteurs devraient avoir la possibilité d'accéder à des semis de haute qualité à un prix abordable. Actuellement, les agriculteurs comptent sur la régénération naturelle qui est inefficace et une source potentielle de ravageurs. La macropropagation est une méthode de propagation de rechange qui peut fournir des semis à un prix abordable. Dans cette étude, l'efficacité de la macropropagation des variétés des bananes préférées par les agriculteurs sera déterminée en fonction de leurs zones agro-écologiques.

Mots clés: Agro-écologie, banane, macropropagation, variétés

Background

Food deficiencies often occur in Kenya due to overdependence on a narrow range of crops and increasing climate change effects. For most crops, the rains received are insufficient and unpredictable leading to poor yields. Banana is one of the crops

that can improve food security and income since it grows under diverse ecological conditions and produces all year round. In Africa, expansion of banana cultivation is greatly hindered by scarcity of high quality seedlings for establishing new and expanding existing plantations. Most farmers depend on natural regeneration of existing banana plants to obtain seedlings, which is a slow process and quite often does not yield adequate suckers of the desired varieties. Naturally produced suckers are also a source of pests and diseases that reduce productivity and increase the cost of production due to need for pest control measures. Since natural regeneration is unreliable, new and more efficient propagation methods are required. To increase adoption, an alternative propagation method should be low cost and require low skill to implement. Although tissue culture (TC) propagation is efficient in terms of quantity and quality, its adoption is constrained by high capital and skill requirements, in addition to occurrence of somaclonal variation.

An alternative propagation method that uses detached corm method (*macropropagation*) has been proposed. This involves stimulation of lateral growth of multiple latent buds in a corm within a chamber where humidity and temperature are controlled. A corm is capable of producing 10 to 30 plantlets in four months, but the productivity may vary with banana variety, agroecology and bud manipulation applied. Macropropagation is a relatively new approach and is yet to be widely adopted in Kenya. To increase its adoption, farmers and stakeholders in the banana sector need information about this technology. Specifically, information is needed on its efficiency compared to current propagation methods, i.e., natural regeneration and tissue culture.

During a recent survey on banana production in Eastern and Central provinces of Kenya, varieties preferred by farmers due to high market demand were identified and their seed systems documented. Results showed that cultivar preference is mostly influenced by market demand, with the desert varieties Kampala, Israel and Grandnain dominating demand. Several traditional and cooking varieties e.g. Muraru, Mutahato, Nyahobe, Mbiri, Kibunda and Kiganda/ Githumo are also in demand. The survey found that most farmers rely on natural regeneration to obtain planting materials. This trend was noted to be particularly risky for the Gros Mitchel due to the high incidence of Fusarium wilt, which is spread through infected planting materials.

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This study has identified an opportunity for introducing macropropagation to improve farmers' access to high quality seedlings of the preferred varieties. In the next phase of this project macropropagation technology will be introduced and its efficiency to propagate seedlings of the preferred varieties evaluated at different agroecological conditions. Macropropagation will be compared to other propagation technologies, including low cost tissue culture and natural regeneration. The propagation methods will be compared in terms of skill and capital requirement, efficiency of propagation as affected by genotype, seedling yield over time, and establishment of suckers after transplanting. The study will determine and recommend which varieties, among the most preferred ones, can be efficiently propagated through macropropagation.

Literature Summary

Demand for banana products is high which has led to increased demand for high quality banana seedlings. Across Africa, expansion of banana cultivation is hindered by scarcity of high quality seedlings (Nkendah and Akyeampong, 2003).Currently bananas are propagated through tissue culture (TC) and natural regeneration. Although TC produces large numbers of pest free seedlings, adoption of this technology has been limited due to the high cost of implementation. In addition to requiring intense management, some farmers in Kenya have reported rapid deterioration of orchards established using TC seedlings (Mbaka *et al.*, 2008). On the other hand naturally regenerated suckers hardly achieve uniformity after transplanting and hence are not suited for commercial production. In addition these suckers are likely to carry pests to new plantations. There is therefore need to introduce efficient propagation methods that will deliver quality seedlings affordably.

Macropropagation is a relatively new technology for banana seedling production. A banana corm contains several axillary buds with meristems at different ages and stages of development (Tenkouano *et al.*, 2006). Macro propagation involves stimulation of lateral growth of latent buds in a corm within a chamber where temperature and humidity are controlled. Scarification of buds further increase suckering by a factor of 2-10 (Tenkouano *et al.,* 2006). Compared to TC, macro propagation is easier to grasp and requires less capital. Due to the low cost involved in production, the seedlings are priced at 40- 50% less than the cost of seedlings produced through tissue culture (Mwangi and Muthoni, 2008).

Observations in Cameroon and Nigeria showed that seedling obtained from macro propagation had uniform size and tolerated post establishment better than TC plants (Tenkouano *et al.*, 2006). In East Africa, macropropagation was recently piloted under the crop crisis control project (C3P) (Mwangi *et al.*, 2008). In this study efficiency of macropropagation technology will be evaluated on banana varieties with high market demand in Kenya.

Study Description

A survey was recently carried out to identify banana genotypes preferred by farmers in Eastern and Central Kenya. Results showed that desert cultivars are more preferred due to higher market demand in all areas. Cultivars Kampala (Gros Michel), Israel (Grand Nain), Giant Cavedish are the most preferred desert varieties. Several cooking varieties were also identified that are in high demand in some districts, e.g Githumo, Kiganda, Mutahato. These varieties will be studied to determine their efficiency of seedling production through macropropagation. Macropropagation will be compared to existing seed production methods, i.e., TC and natural regeneration, in terms of yield, cost and skill requirement. The field experiments will be carried out at different agro ecological zones to especially determine the influence of temperature factor on propagation method.

Research Application

This research will determine efficiency of macropropagation of banana varieties preferred in Eastern and Central Kenya. The results will be used to promote macropropagation technology and to determine any adjustments that may be required to increase its adoption.

Acknowledgement

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