

**Fitting banana tissue culture planting material into farmers' cultural values in Central Uganda: Challenge to control of banana *Xanthomonas* wilt**

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**Abstract**

Banana tissue culture planting materials are one of the strategies for fighting the Banana *Xanthomonas* Wilt (BXW) disease in Uganda. The disease is a major threat to food and income security in parts of Uganda where banana is an important staple or cash crop. Several initiatives by the Government of Uganda, Research Institutes and CGIAR centres have promoted the use of Tissue Culture technology as a way of availing clean planting material to reduce the spread of BXW. However, its uptake is still low. In this paper, we seek to broaden explanations of factors that constrain uptake of Tissue Culture banana planting materials taking into account the cultural context of banana cultivation. Focus group discussions and interviews were conducted with banana farmers to provide information on banana varieties that the communities cultivated and why farmers chose those particular varieties. The results show that farmers regard TC as incompatible with their tastes and preferences of the banana crop for traditional food and drinks, cultural and traditional practices. It is thought to be a risky venture because of it is perceived as unsuitable and inadaptable to local weather and soil conditions. Further, it is perceived as complex to use, farmers requiring more knowledge and information on how to plant and maintain the plantlets on-farm. In these aspects, it does not align to the cultural values cognizant to societal welfare and wellbeing. These findings indicate that efforts to control BXW would be beneficial by taking a location specific and holistic approach encompassing aspects of clean banana planting materials but with cultural and traditional dimensions embedded therein.

**Keywords:** Banana tissue culture planting materials, Banana *Xanthomonas* Wilt, cultural values, Uganda

**Résumé**

Le matériel de plantation des cultures de bananiers est l'une des stratégies de lutte contre la maladie du flétrissement bactérien du bananier (BXW) en Ouganda. La maladie constitue une menace majeure pour la sécurité alimentaire et la sécurité des revenus dans certaines parties de l'Ouganda, où la banane est une culture de base ou une culture de rente importante. Plusieurs initiatives prises par le gouvernement ougandais, des instituts de

recherche et des centres CGIAR ont encouragé l'utilisation de la technologie de la culture de tissus comme moyen de disposer de matériel de plantation propre pour réduire la propagation du BXW. Cependant, son adoption est encore faible. Dans cet article, nous cherchons à élargir les explications sur les facteurs qui entravent l'adoption de matériel de plantation de bananiers en culture tissulaire en tenant compte du contexte culturel de la culture de la banane. Des discussions en groupes et des entretiens ont été menés avec des producteurs de bananes pour fournir des informations sur les variétés de bananes cultivées par les communautés et les raisons pour lesquelles les agriculteurs ont choisi ces variétés. Les résultats montrent que les agriculteurs considèrent la TC comme incompatible avec leurs goûts et préférences de la culture de la banane pour la nourriture et les boissons traditionnelles, les pratiques culturelles et traditionnelles. Il est perçu comme une entreprise risquée en raison de sa désappropriation et de son inadaptabilité aux conditions météorologiques et pédologiques locales. En outre, il est perçu comme complexe à utiliser, les agriculteurs ayant besoin de plus de connaissances et d'informations sur la manière de planter et d'entretenir les plantules à la ferme. Dans ces aspects, il ne s'aligne pas sur les valeurs culturelles liées à l'intérêt et au bien-être de la société. Ces résultats indiquent que les efforts visant à contrôler le BXW seraient bénéfiques en adoptant une approche spécifique et holistique du lieu englobant des aspects du matériel de plantation de bananes propres, mais avec des dimensions culturelles et traditionnelles qui y sont intégrées.

Mots clés: matériel de plantation en culture tissulaire de bananier, Flétrissement bactérien du bananier, valeurs culturelles, Ouganda

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## Background

Banana *Xanthomonas* Wilt (BXW) disease is a major threat to food and income security in parts of Uganda where banana is an important staple or cash crop. The disease is caused by the bacterium *Xanthomonas campestris* pv. *musacearum*. This disease has been a main reason for declining banana yields since its emergence in 2001 (Karamura *et al.*, 2010; Blomme *et al.*, 2017). It can wipe out entire crop holdings where highly susceptible genotypes dominate the farming systems (Kubiriba *et al.*, 2012) with disastrous effects to the livelihoods of especially the poor smallholder farmers. The disease was first reported in Mukono District in 2001 (Tushemereirwe *et al.*, 2004) and by 2005 it had rapidly spread to the major banana producing areas of South Western Uganda. It is estimated that between 2002-2005, the disease caused a cumulative economic loss of 61.1 million dollars to the country, mainly associated with the East African Highland Banana (EAHB) 'Matooke' (AAA-EAHB genome) and the 'Kayinja' beer banana (ABB genome) (Tushemereirwe *et al.*, 2009). Similar losses associated with BXW are reported in other East African countries (see Anon., 2006; Mgenzi *et al.*, 2006; Ndugo *et al.*, 2006; Mbaka *et al.*, 2007).

The use of disease free planting materials has been put forward as a key factor in the management of the disease. Tissue culture (TC) derived planting plantlets are clearly disease free and have been recommended to farmers for raising bananas. However uptake of these materials by farmers has been slow. Farmers' reluctance to take up TC planting materials has been attributed to economic factors such as high cost of seedlings, higher labour and input requirements (Muyanga, 2009; Njau *et al.*, 2011). This however does not adequately explain

the low uptake of TC banana planting materials especially where bananas are a major cash crop. In such areas, the cost of TC planting materials is far lower than the loss caused by BXW. Bananas especially in Uganda are not only for food and income but they are also cultural artefacts and also mediate social interactions. The objective of this research was to broaden explanations of factors that constrain uptake of TC banana planting materials by taking into account the social and cultural contexts in which banana is grown.

### **Study description**

The study was conducted in Luweero and Mukono districts in Central Uganda where TC banana planting materials have been promoted for more than a decade. The two districts experience high prevalence of BXW (Buregyeya *et al.*, 2014; Ocimati *et al.*, 2015) despite numerous interventions to curb the disease. To facilitate access to the TC materials, farmers in the two districts were linked to TC laboratories (whence they obtained TC plantlets) through farmer managed community-based TC nurseries. The study targeted two villages (one in each district) that hosted the community-based TC nurseries on assumption that proximity would enhance farmer access to TC planting materials. Focus Group Discussions (FGDs) and qualitative interviews of key informants were used to collect information on banana varieties grown in the communities, reasons for choosing such varieties and cultural issues pertaining to the varieties they grow.

### **Results and discussion**

Forty-six banana varieties (Table 1) were identified in the study communities. The varieties are categorized into four, based on their main purpose- namely; cooking banana commonly known as matooke, a traditional food; dessert banana, eaten when ripe; brewing banana for making traditional beer also commonly known as omwenge omuganda and roasting banana. All bananas are consumed though in different forms; as matooke, desert, and as brew/juice. Whereas several cooking varieties are grown in a single plantation, there are some that farmers prefer for their own consumption because of their taste, flavour, colour (yellowish), texture (soft) and aroma. These may not be high yielding in terms of bunch size but they have preferred consumption attributes.

Some varieties are used to prepare special dishes for cultural occasions such as 'kwanjula' (a traditional marriage ceremony where a bride introduces the groom to her parents and relatives); celebrations of the birth of twins; and funeral rites ceremonies. The varieties propagated through TC are mainly of the commercial cooking type (Table 1), characterized by bigger bunches and fingers that are more attractive for the market. Whereas income is a primary goal for banana production but it is not the only reason farmers grow banana. The other varieties that are purposely grown for specific cultural functions are commonly not propagated through TC because they are considered unattractive commercially.

For example, one of the farmers stated:

*“Not all cooking type varieties make good matooke. Some varieties are better and as a farmer who has a choice, I would prefer matooke from specific varieties like Nakitembe,*

*Musakala, Muziranyama and Nakawere even though these may not be the best choice varieties for the market .....*”

**Table 1. Banana varieties grown in Central Uganda**

Banana varieties	Clone set	Genome	Major purpose
<i>Kisansa</i> ●	Musakala	AAA-EA	Cooking
<i>Mpologoma</i> ●			
<i>Mpologoma omukadde</i>			
<i>Musakala</i> ●			
<i>Muvubo</i> *			
<i>Namunwe</i>			
<i>Mbwazirume</i>	Nakitembe	AAA-EA	Cooking
<i>Nakamali</i>			
<i>Nakitembe</i> ●			
<i>Nalugolimo</i>			
<i>Nandigobe</i>			
<i>Nasalugiri-Soola mwana</i>			
<i>Wakirigga</i>	Nakabululu	AAA-EA	Cooking
<i>Kibuzi</i> ●			
<i>Mukubyakonde</i> *			
<i>Nakabululu</i>	Nfuuka	AAA-EA	Cooking
<i>Nakyetengu</i> *			
<i>Atwalirannyina</i>			
<i>Katwalo</i>			
<i>Lusumba</i>			
<i>Muziranyama</i>			
<i>Nabusa</i>			
<i>Nakabinyi</i>			
<i>Nakawere</i> *			
<i>Nakinyika</i>			
<i>Nambi</i> *			
<i>Namwezi</i>	Mbidde	AAA-EA	Juice/Brewing
<i>Ndibwabalangira</i>			
<i>Nfuuka</i> ●			
<i>Siira</i> *			
<i>Nabununike</i>	Mbidde	AAA-EA	Juice/Brewing
<i>Mayovu</i> *			
<i>Mwezigumu</i> *			
<i>Kyesusa</i>			
<i>Embidde enganda</i> ( <i>Kabula &amp; Nsowe</i> ) *			
<i>Improved Ndiizi</i> ●		AAA	Dessert
<i>Bogoya</i>		AAAA	Dessert
<i>FHIA – 17</i> ●		AAAA	Cooking & Dessert
<i>FHIA - 01</i> ●		AAAA	Cooking
<i>FHIA 25</i> ●			Juice/brewing
<i>KM5(Kabana 5)</i> ●		AAB	Dessert
<i>Gonja (Nakatansese &amp; Manjaya)</i> ●			Roasting
<i>Kayinja</i>		ABB	Brewing
<i>Kisubi</i>		AB	Brewing
<i>Kivuuvu</i>		ABB	Dessert
<i>Sukali Ndiizi</i>		AAB	Dessert

Additionally, farmers take into account the perceived variance in strengths and weaknesses of the banana varieties that they grow. For example, in one of the FGDs, a farmer specified:

*“I grow several varieties on my plantation. I have ‘Mpologoma omukadde’ which makes tasty food, but is highly susceptible to drought. I also have ‘Siira’ which does not make tasty food like ‘Mpologoma omukadde’ (has hard texture, white color and cools fast after preparation) but it is drought tolerant and resistant to pests and diseases. I also grow other varieties like ‘Nakamali’ with small finger and bunch size but their mats never lack food and they additionally exhibit tolerance to most pests and diseases, including BXW. This way, I am able to find food whenever I visit my plantation. ”*

The high diversity of banana varieties grown by a single farmer is to meet the various purposes including the socio-cultural purposes. By focusing mainly on commercial interests, TC propagation and distribution has focused solely on only a few banana varieties (Table 1). This absence of a range of options to meet the multiple interests of the farmers is part of the reasons some farmers may not easily take up TC planting materials. In any case, even if they took up TC planting materials for specific varieties and mixed them with other varieties (possibly BXW infected suckers) for cultural purposes, there would be cross-infection and the aim of using TC propagated materials would not be achieved.

## **Conclusion**

Efforts to control BXW would be of benefit if a location specific and holistic approach encompassing aspects of clean planting material (but with cultural dimensions embedded therein) is taken. Provision of a wide range of varieties through TC that satisfy the multiple functions of banana including cultural purposes.

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