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Evaluation of promising sweetpotato genotypes for high altitude, cool, moist agroecologies of Uganda

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Abstract

Eighteen genotypes from the National Sweetpotato Programme were evaluated for their fresh storage root yield and reaction to stem and leaf blight (*Alternaria bataticola*) at Kachwekano (2000 metres above sea level) in Southwest Uganda. The trials were set up to identify sweetpotato genotypes with adaptation to highland agroecologies with special reference to resistance to *Alternaria* blight. Alternaria blight was scored at harvest time on a scale of 1-5 (1=symptomless and 5= severe infection) and storage root yields were taken at harvest. Based on the evaluation made during crop growth and at harvest, four genotypes and the local check, Magabari, had high levels of resistance to *Alternaria* blight. Eight genotypes had total storage root yield higher than the local check indicating higher yield potential of the new genotypes. The differences in yield and susceptibility to *Alternaria* from the breeding programme offer great advances in breeding varieties for highland tropical environments where the disease is of major importance.

Key words: ***Alternaria bataticola***, genotypes, resistance, sweetpotato.

Introduction

Sweetpotato (Convulvulaceae:*Ipomoea batatas* (Lam)L) is the third most important food crop in Uganda after bananas and cassava (Bashaasha *et al* 1995). Annual production is 2.2 million tons from about 500,000 ha of land (FAO 1996). They are a major starch staple (Bashasha *et al* 1995, Smit 1997) for the majority of the smallholder communuties of Uganda and to some extent source of income. Sweetpotato cultivation is throughout the country in all the three major agroecological zones of Uganda (Table 1). There are several pests and diseases that reduce yields in addition to abiotic facotors like temperature, and low soil fertility. Among these are virus complexes, leaf and stem blight caused by *Alternaria bataticola*, weevils and catterpillars and several mammals.
There are three major agroecological zones in Uganda, ranging from cool highlands to the warm sub-humid environments in Eastern Uganda. Severity of *Alternaria* blight depends on environmental conditions getting more severe as conditions get cooler and moist. Disease and lesion size increaese with altitude with high relative humidity or free water necessary for infection and sporulation (Ames *et al* 1996).

Stem and leaf blight on sweetpotatoes caused by the fungal pathogen *Alternaria bataticola* has been reported in East and Central Africa (Skoglund *et al* 1992, Lutaladio 1995) and has become a serious threat to dissemination of improved sweetpotato genotypes in Uganda. Reports about *Alternaria* disease and breeding for resistance has been reported by several authors. Ted Carey 1997 quating Janseen 1982 and Ndamage et al 1992 reported that two high yielding varieties with good taste and resistance to SPVD and *Alternaria* blight were identified and disseminated by the Rwanda Sweetpotato Programme. Host resistance to *Alternaria* blight in sweetpotato is reported to exist (Ames 1998) while its control can be achieved through integration of various control practices such as cultural methods as well as host resistance (Ames 1996).

Evaluation of potential clones developed by Namulonge Agricultural and Animal Production Research Institute (NAARI) sweetpotato programme for resistance to *Alternaria* blight was carried out in 1995 and 1996. Screening and breeding for resistance to *Alternaria* is an integral part of these efforts with the overall objectives of developing resistant varieties (Turyamureeba *et al* 1997).

Materials and methods

Seventeen genotypes were evaluated for adaptation to the Southwest highland agroecology altitude at Kachwekano, 2,000 m above sea level during 1995A rainy season. One locally important variety, Magabari known for adaptation to cool environments was included in the trial as a check. The trial was established in a RCBD replicated three times. Plot size was 5.4 m long, spaced 1 m between ridges. Spacing between ridges wa 1 m apart with intra row spacing of 30 cm from vine to vine (33,333). Vine tips 30cm long were used for planting the trial. Planting was done on November 7, 1995 and harvesting was on January 31, 1996. The second trial was planted in 1996 second rainy season at the same location. Twelve.clones and six released varieties were planted in randomised complete block design replicated three times. Plots were 3 m long with 1 m between rows and 30cm from vine to vine.

Planting was done on November 30, 1996 and harvesting was on June 26, 1997.

During crop growth, data was collected on establishment and *Alternaria* blight disease severity. A scale of 1-5 was used to assess severity where 1 was symptomless 2 showed mild symptoms, 3 had intermediate attack, 4 had severe symptoms and 5 highly diseased. Yield data was taken at harvest from the entire plot on marketable root yield and total root yield. Dry matter content was recorded after drying the samples at 650C to stable weight at Namulonge for the 1995 planted trial.

Results and discussion

Yield data, *Alternaria* disease severity and dry matter content of the clones evaluated during 1995a and 1996b season is presented in Table 2 and 3. There was high significant differences (p=0.05) in storage root yields and *Alternaria* disease in the two trials. During 1995a, total fresh root yields ranged from 8.7 t/ha to 0.9 t/ha. The main reason for the low yields was largely due to *Alternaria* blight and probably low soil fertility (Table 1). There is an association between increasing severity of Alternaria blight and declining soil fertility (Low 1997). Four clones namely 137, 192, 218, and 324 showed high levels of resistance to *Alternaria* blight and high yields than the local check Magabari. Yields during 1996b season ranged from 10.0 t/ ha for genotype 324 which was also resistant to *Alternaria* blight to 2.5t /ha for genotype 69 with slight *Alternaria* attack. Clone 69 had high severity during 1995a season. *Allternaria* disease severity was more during 1995a than 1996b season among most genotypes evaluated. Genotypes 324, 218, 316, and 137 had no symptoms at this location during both seasons indicating high levels of resitance to *Alternaria* blight disease.Dry matter content was high during 1995A seasons trial ranging from 29.2 %

Table 1. Major sweetpotato agroecological zones in Uganda, their distribution, and associated constraints.

Agroecological zone	Major area of zone	Principal constraints
Warm, Moist tall grassland environments(bimodal rainfall)	Central Uganda	SPVD
Warm subhumid short grassland environments	North and Northeast Uganda	Weevils (*Cylas punticolis, Cylas brunneus)* Drought Scarcity of planting material
Cool, Moist highland environments (bimodal rainfall)	Highland zones of south west Uganda, Mbale west Nile	*Alternaria* disease Low soil fertility Root rats

Table 2. Performance of sweetpotato genotypes in and advanced yield trial at Kachwekano DFI during 1995A season.

Clone	Total root yield (t/ha)	Marketable root yield	*Alternaria* score (1-5) t/ha	DMC (%)
192	8.7	5.9	3.0	34.0
202	8.1	5.9	3.3	31.6
218	7.2	5.6	1.0	32.8
324	6.9	5.7	1.0	31.0
SOWOLA	5.7	4.4	1.3	37.7
137	5.0	3.3	1.0	31.1
271	4.5	3.4	4.7	30.9
WAGABOLIGE	4.2	3.3	4.0	29.2
MAGABARI	4.2	2.8	1.0	37.5
69	4.1	2.8	4.0	29.9
BWANJULE	3.9	2.3	1.0	30.9
TANZANIA	3.8	2.7	1.3	33.8
282	3.7	2.0	4.7	30.3
NEW KAWOGO	3.4	2.6	4.7	30.0
148	2.7	1.5	4.7	30.5
52	2.1	0.8	5.0	31.8
TORORO- 3	1.5	0.6	3.7	-
178	0.9	0.4	4.7	-
Mean	4.5	3.1	3.0	
C.V %	58.9	67.7	20.61	
LSD 0.05	4.4	1.5	1.0	

Table 3. Performance of sweetpotato genotypes in an advanced yield trial at Kachwekano DFI during 1996B season.

Clone	Total root yield (t/ha)	*Alternaria* score (1-5)
324	10.0	1.0
202	9.9	2.0
52	8.8	2.3
277	8.2	2.3
271	7.5	1.0
218	6.8	1.0
316	6.5	1.0
192	4.7	1.0
137	4.2	1.0
178	3.5	2.3
282	3.4	2.0
69	2.5	2.0
SOWOLA	6.1	1.0
NEW KAWOGO	5.5	2.3
TANZANIA	4.7	1.3
WAGABOLIGE	4.6	2.3
TORORO-3	4.0	2.3
BWANJULE	3.7	1.0
Mean	5.8	1.6
CV %	45.4	21.3
LSD 0.05	4.4	0.6

for variety Wagabolige to 37.7% for variety Sowola. Local check Magabari with already established consumer preferance had a dry matter content of 37.5%.

Conclusion

The major constraints to sweetpotato at high elevation is mainly leaf and stem blights caused by *Alternaria bataticola*, few adapted cultivars, and low soil fertility. Availability of healthy planting material is sometimes critical especially after outbreaks of caterpillars and or drought. Four clones which have been identified as resistant to the *Alternaria* blight disease, 218, 324, 316, and 192 will further be evaluated in on-farm trials and selections will be recommended for cultivation in high altitude environments.

More genotypes will be evaluated at Kachwekano to identify more suitable clones for this specific agroecological zone. It should be noted that such varieties could be appropriate and adapted to tropical highland environments with similar agroecological conditions and constraints like Rwanda, Burundi, Ethiopia, and Congo.

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