Screening cold tolerant dual purpose sweetpotato in Kenya

Kivuva, B. M.[1], R.O.M. Mwanga[2], J. Low[2] and S. Agilli[3].
[1]Kenya Agricultural and Livestock Research Organization (KALRO), Katumani, Box 340 - 90100, Nairobi, Kenya: benmusem@yahoo.com, [2] International Potato Center (CIP), Box 30148 - 00100, Kampala, Uganda : r.mwanga@cgiar.org,[3] International Potato Center (CIP), Box 14733 -00800, Nairobi, Kenya; j.low@cgiar.org

Summary: Sweetpotato is 3rd most important root crop, in Sub Saharan Africa. Scientist-farmer participatory evaluation for dual purpose targeting agricultural potential cold areas (1600 – 2100 meters above sea level (masl)) of selected 50 clones was done onfarm. Genotype and environment effect were significant. The evaluation and organoleptic test identified genotypes potential for dual use in the cold areas as shown in the results below. These clones will be advanced to national performance trials for variety release consideration

Introduction: Sweetpotato Ranks 5th economically, 3rd most important root crop, is a source of food, feed, income to resource-poor, and remedy to Vit. A, Zinc and Iron deficiency. It's world and Kenya production are 14.7 tha^{-1}, 9.5 tha^{-1} respectively. The crop is increasingly used for animal forage and or silage making, due to diminishing pasture land. Its forage improve greatly milk and meat production, however dual purpose varieties suitable for dairy farming areas, usually cold (1600 – 2100 masl), have not been bred in East Africa, hence necessitating this work.

Materials and methods:
Screening of 50 clones selected from 13,000 polycross seedlings based on; no pubescence, green vines, large un-serrated leaves, high vine and root yield was done on farmer-researcher participatory evaluation on four onfarm sites namely; Runyenjes, Manyata, Kangundo, and Kiboko. 30 cm long cuttings were planted slanted at 60º , 10 cm deep, under randomized complete block design in single rows of 10 hills, on molded ridges, spaced at 100 x 30 cm replicated 3 times. Data on vine foliage and root biomass collected. Farmer's identified best performing clones for dual purpose at harvest based on root, foliage yield and cooked test. Data was analyzed using R statistical software and results presented below.

Results and discussion:

- Results are shown in tale 1-3 and figure 1 a,b,c,d and 2
- Genotype (G), environment(E) and interactions (I) on root and forage yield were significant depicting genetic variability to exploit for cold tolerant dual purpose clones.
- Clones Silklow (SK) 2, BND 15, Naspot (NP) II 3 and Kigabali (KB)17 had high forage root ratio and thus may have cold tolerant dual purpose potential.
- Clones Kyabafuruki (KBF) 20, New Kawogo (NK) 7, and Kyebandula (KB) 9, had GxE effects > 3 on root and forage yield, depicting positive genetic selection response.
- Kigabari (KB) 15, Silklow (SK) 6, SilkLow (SK) 2, BND 15, BND 1, and Naspot (NP) II 3 had good cooking qualities.
- The AMMI and Tai stability plots identified stable clones (within the origin e.g. Silklow (SK)2 and Silklow (SK) 6), e , i

(c) Field trial-Kakamega

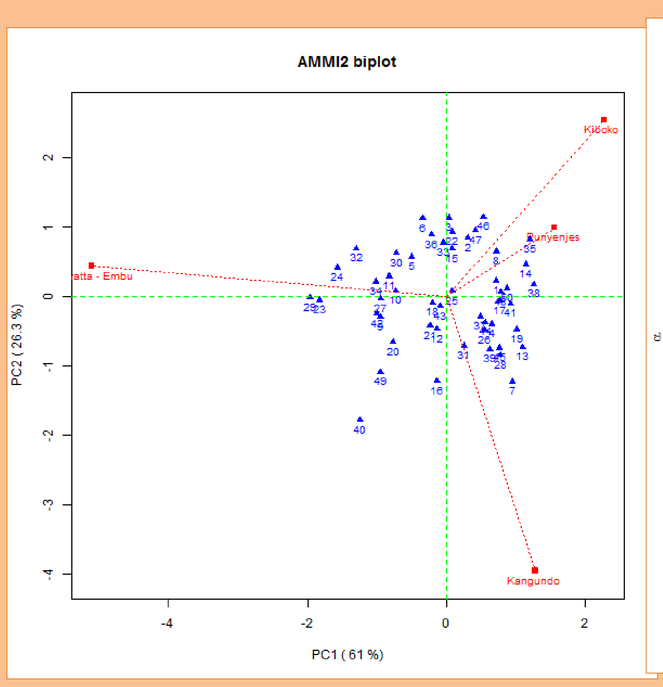
(d) Silklow 6 - Orange fleshed

Table 1. Storage roots ANOVA

Source	Df	Sum Sq	Mean Sq	F value	Pr (>F)
G	49	2840.5	58.0	2.2	<0.001
E	3	9707.3	3235.8	7.1	0.012
R:E	8	3667.4	458.4	17.0	<0.001
GxE	147	6107.7	41.5	1.5	<0.001
Residuals	384	10332.9	26.9		

Table 2. Clones with > 20 tha^{-1} of forage with their performance on other traits where; F = forage, R = root, Y = yield, G = genotype, E = environment, Ef = effects and MTS = mean test score

ID	Genotype	FY tha^{-1}	RY tha^{-1}	F/R	GxE R Ef	GxE F Ef	MTS
18	SILKLOW 2	44.9	16.8	1.6	1.2	17.8	8
39	BND 15	38.5	5.5	3.3	3.7	14.1	8
27	NASPOT II 3	37.3	5.1	2.5	4.4	15.5	7
36	KIGABALI 17	35.6	17.2	1.1	1.7	14	6
23	KYABAFURUKI 20	28.3	21.3	1.1	9.1	9.9	6
10	KIGABARI 15	27.4	17.5	1	3.7	8.4	9
11	NEW KAWOGO 7	27.2	15.3	1.5	4.2	7.7	5
30	KYEBANDULA 9	26.3	14.8	1.4	3.9	7.5	5
21	SILKLOW 6	24.1	14.3	1.1	0	-1	9
49	BND 1	23.9	17.9	1.2	4.4	3.1	8
17	MUGANDE (Control)	22.4	8.4	2.7	1.1	1.8	5



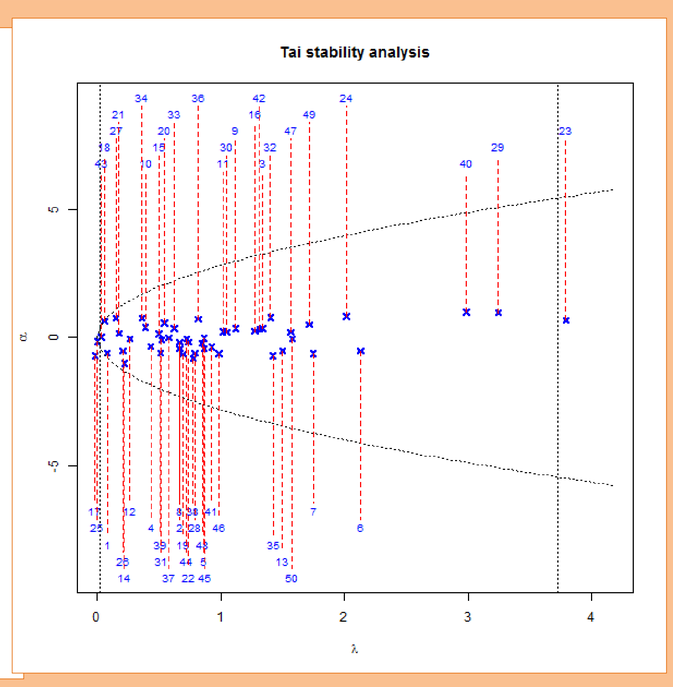


Figure 2. AMMI and Tai stability plots based on two principal components

Table 3. Clone identification on the AMMI and Tai plots

ID	Clone	ID	Clone	ID	Clone	ID	Clone	ID	Clone	ID	Clone	ID	Clone
1	MB 10	8	MB 3	15	SK 6	22	KYB 1	29	KYBF 12	36	KB 17	43	KB 9
2	MB 5	9	NK 19	16	NK 259 1	23	KYBF 20	30	KYB 9	37	KB 8	44	SH 8
3	MB 4	10	KB 15	17	KYB 10	24	NP II 15	31	NP II 12	38	RB 1	45	BND 16
4	MB 13	11	NK 7	18	SK 2	25	KYB 3	32	KYBF 11	39	BND 15	46	NP 7
5	MB 1	12	KB 16	19	KYB 13	26	KYB 6	33	KB 14	40	SH 5	47	SH 13
6	DB 20	13	NK 2	20	KYB 16	27	NP II 13	34	KB 6	41	RG 7	48	RB 11
7	NK 14	14	KYB 11	21	SK 7	28	NP II 3	35	DB 17	42	NP 2	49	BND 1
												50	RB 13

Figure 1 (a)Silklow 2: yellow fleshed high root / forage yield

(b) Kigabali 15: Yellow fleshed roots

Conclusion: Clones; Kigabari (KG) 15, Kyebandula (KB) 9, and BND 1 showed high potential for cold tolerant dual purpose and would be screened at NPT for variety release consideration

Acknowledgement: KALRO for allowing the main author to undertake this study and CIP for the funding