Sweetpotato Screening for Drought tolerance and high beta carotene content in Mozambique

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CIP

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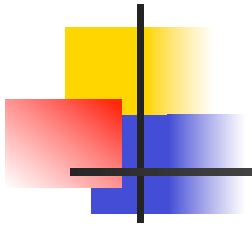
Introduction



- Sweetpotato is an important source of carbohydrates & income in rural area in Mozambique
- It is produced by small-scale farmers under rainfed
- Despite the importance, the yield is still low for small-scale farmers
- Factors contributing to low yields are: drought stress, pest & disease, the use of traditional varieties and low soil fertility

Introduction

- Sp is relative drought tolerant compared to other crops, grown on residual soil moisture during the dry months
- Sp in dried areas is a better crop for reestablishment of crops after dry season
- Many studies showed that severe drought affects SP by retarding growth, reducing root yield, dry matter and affects root quality (weevils)
- Drought also affect the conversation of planting material
- On OFSP is more difficult compared to local varieties

Overall objective

To identify drought tolerant Sp parental lines with better quantitative and qualitative attributes for use in breeding programmes in Mozambique.

Specific Objectives

- a) To identify the drought tolerant varieties in Mozambique

- b) To identify high yield, high dry matter content, high β-carotene content and pest & disease resistant/resistant

Methodology

- Umbelúzi, located in altitude of 12 m
- Temperature varies 23 - 26ºc
- Dry season temperature 17 - 23ºc
- Evaporation 2.8-7.2 mm/day
- Average annual rainfall is 679 mm
- Soil type is fluvial to sand loam

Field experimental procedure

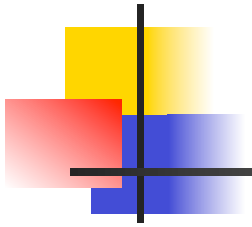
- Conducted from July to December 2008
- Split plot design with 3 reps

The main plot: irrigation levels

- 1) severe stress at the root initiation, water supplied up to 30 DAP
- 2) moderate stress at the root development, water supplied up to 60 DAP;
- 3) nonstress, water supplied up to 120 DAP

Sub-plot**: Genotypes**

- 48 genotypes (12 local, 23 introduced, 13 national breeding)
- No fertilization was applied
- Cuttings vines of 30 cm were planted on the ridges of about 20 cm of height
- Net plot size of 5.4 m^2
- Individual irrigation levels were separated by 6 meters



- Agronomic practices were uniformly implemented to all irrigation levels
- Trial was irrigated using drip irrigation
- Porometer was used to indicate irrigation needs
- Data collection: Climatic, no. of survival plant, vine vigor, virus, weevils, no. of harvested plants, above biomass, commercial & non-commercial roots no & weight, β-c, DM

Selection criteria for drought tolerant

- TOL = Yp - Ys, the smaller value of TOL represents the less sensitive genotypes
- Stress index (SI)=1-($\bar{Y}$s/ $\bar{Y}$p)
- c) SSI=(1-Ys/Yp))/SI , the smaller the SSI, the greater is the stress tolerance
- d)STI)=(Yp/$\bar{Y}$p)*(Ys/$\bar{Y}$s)*($\bar{Y}$p/$\bar{Y}$s)=(Yp)(Ys)/($\bar{Y}$p)², the higher STI for a genotype, the higher its stress tolerance and Yp

Experiment procedure in green house

- RCBD with 2 replications
- All genotypes tested on the field experiment were also used
- Clay and sand soil was mixed and sterilized
- No fertilization was applied as a treatment
- 30 cm vines cutting were used

- Wooden boxes of 150 cm x 80 cm x 20 cm were used
- Net plot of 1.6 m^2
- Vines were planted at rows spacing of 20 cm & 15 cm within row
- Duration trial: 75 DAP
- Plants were watered for 10 DAP & then were completely stopped

Data collection: plant wilt, vine length, vine diameter, no. of branches, no. of internodes, leaf growth, leaf width, vine production

- 4 plants randomly selected per plot were observed
- Measurement was colleted in 3 dates of 20, 40 and 60 DAP
- Plant wilt was taken on visual appearance, using a scale 1 to 9; where 1 is very wilted, 3wilted, 6 little wilting, and 9 no wilting;

Statistical analysis

- ANOVA, mean comparison and biplot were carried out using SAS, GENSTAT statistical packages

Preliminary Results - field

ANOVA table

Parameters/F	% survivor plants	Vine vigour	Above biomass	Virus	Weevils
Genotypes	2.88**	12.49***	11.29***	11.53***	1.53 *
Irrig levels	30.39**	25.65**	6.69 ns	0.94 ns	50.3 ***
GXI	1.13ns	0.67 ns	1.23 ns	0.59 ns	1.40 *

From mean comparison

- Vine vigor- high vv genotypes were observed on xiadla xa kau, ligodo, xihetamakote, gueri, MUSG0609-47, MUSG0608-33, MUSG0615-36, MUSG0606-2, MUSG0623-9, NASPOT, MUSG0616-18 & MUSG0610-45

- **Weevils** GXE* Under severe stress, high weevils incidence were observed in genotypes manhissane, canassumana, resisto, gueri, Zambezi, k566632, MUSG 0616-18, MUSG 0610-45, MUSG 0614-22 and cinco minutos

- Under moderate stress canassumana, k566632 & gababga show low weevils incidence

ANOVA Table

Parameters/F	Total yield	Total biomass	HI	B-C	DM
Genotypes	12.04***	8.98 ***	14.85***	27.47***	2.06 ***
Irrig levels	18.48*	11.09 *	32.26**	10.75*	0.29 ns
GXI	1.57**	1.21 ns	1.07ns	0.92 ns	1.07 ns

- **Yield high potential** was observed for genotypes 199062.1, MUSG0609-47, MUSG016-18, MUSG0623-09, Tainung64, MUSG0615-36, MUSG0608-33 and MUSG0622-60

- **Under severe stress**, high yield was revealed in 199062.1, MUSG0609-47, MUSG0616-18, MUSG0623-9, Jonathan-nairobi, Tainung64, Lo323, MUSG0608-33 and Atacana

B-C, higher was observed in MUSG 0609-47, MUSG 0616-18, MUSG 0606-2, resisto-narirobi, MUSG 0608-33, MUSG 0614-22, MUSG 0615-36, resisto and carrot-c

- Local germplasm had lower beta-carotene content
- DM- Among genotypes evaluated, ukerewe , Mgcl01 (34.13%), K566632 (33.88%), naspot (33.79%), pipi (33.36%) and xitsekele (33.04) showed higher dry matter content

According to selection attributes

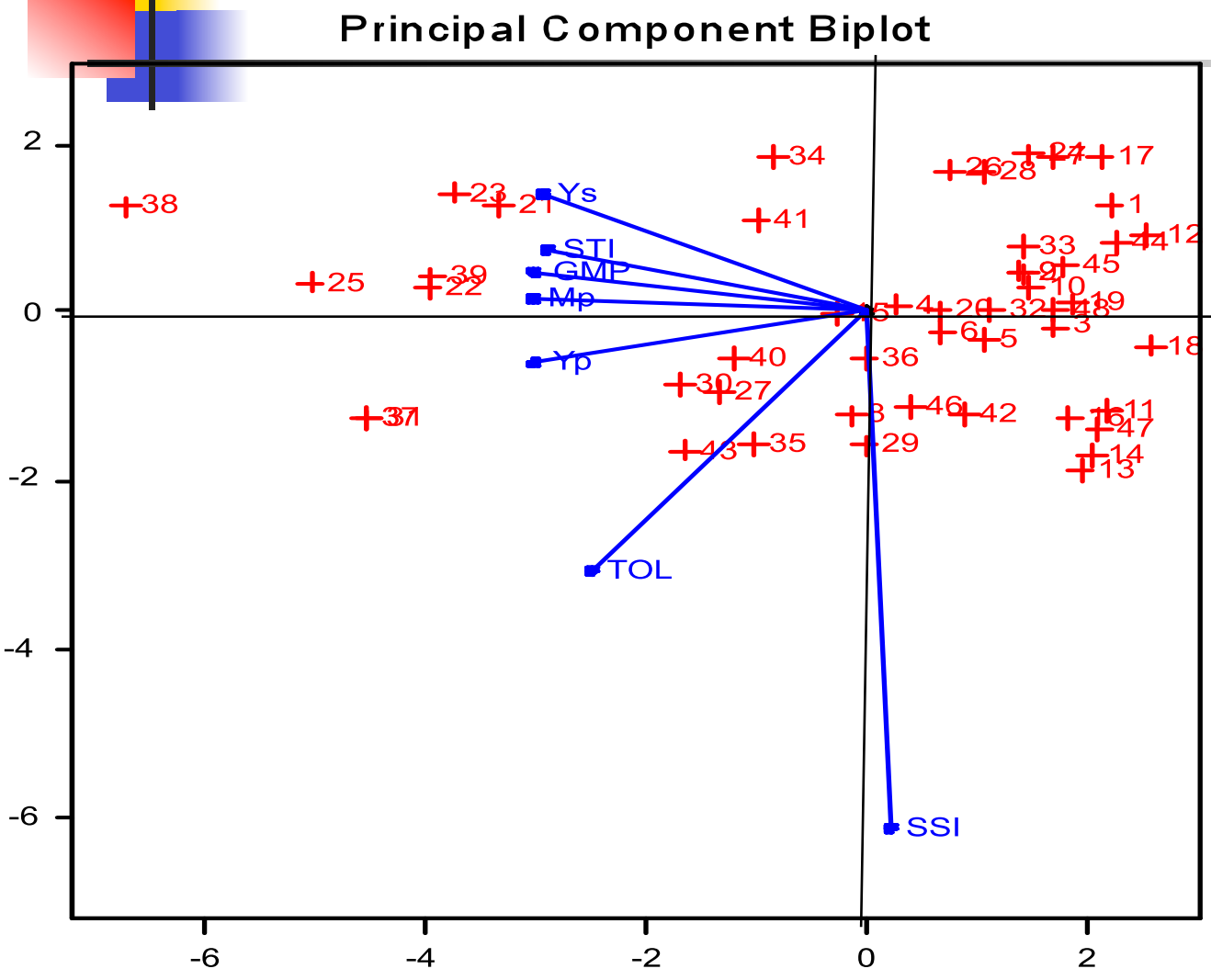
In moderate stress:

- Tolerant genotypes- with high STI - MUSG0608-33 MUSG0623-9, MUSG0616-18, Tainung64, MUSG0622-60, MUSG0615-36 & 199062.1 with uniform superiority in both moderate stress and irrigated treatments

In severe stress:

- Tolerant genotypes- MUSG0608-33, Tainung64, 199062.1, MUSG0609-47, MUSG0616-18, MUSG0623-9, LO323 and Jonathan-nairobi

Biplot under moderate stress



Drought tolerance

199062.1 (21)

MUSG0616-18(23)

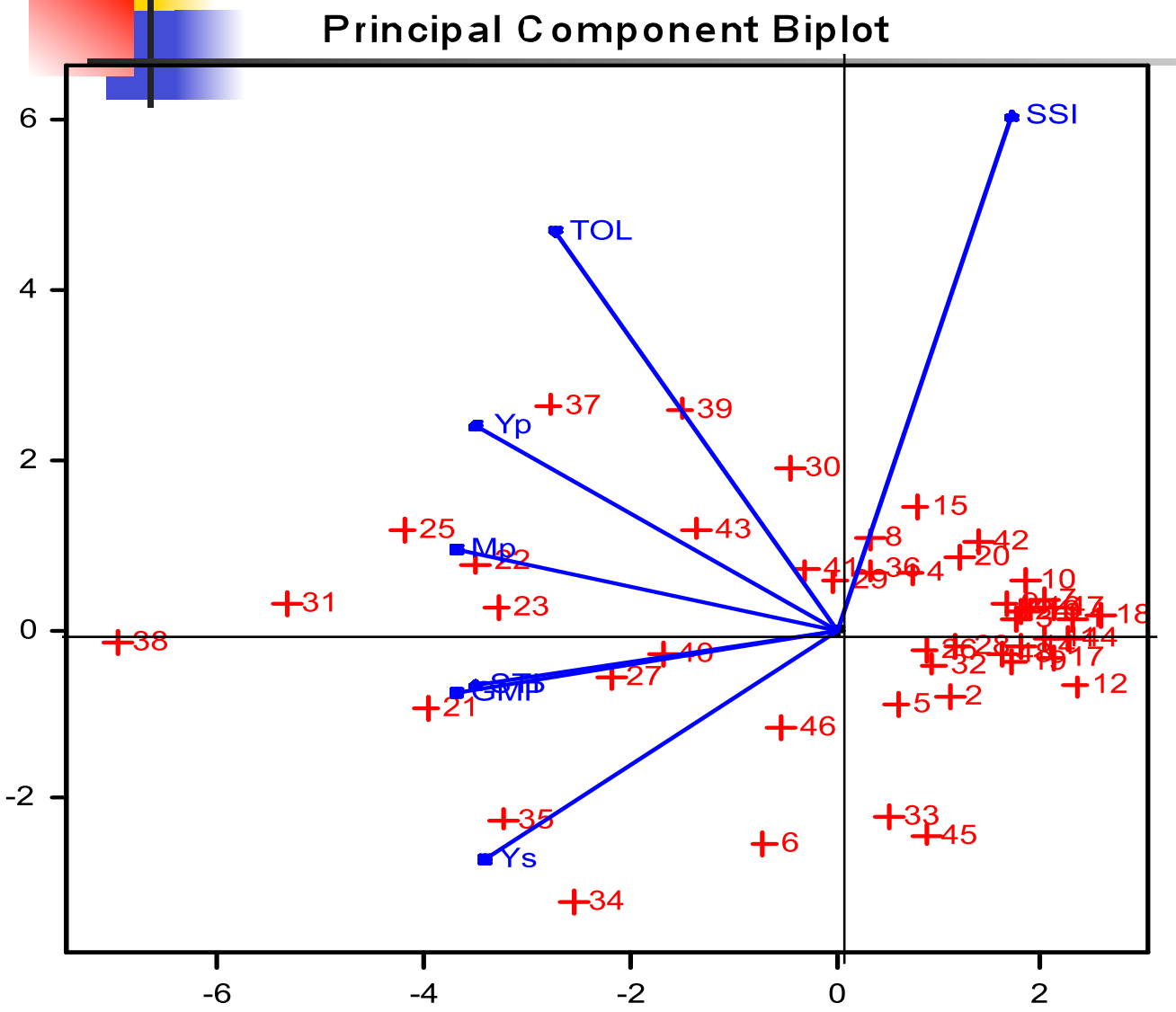
MUSG0622-60 (39)

MUSG0609-47 (22)

MUSG0623-9 (25)

MUSG0608-33 (38)

Biplot under moderate stress



Drought tolerance
199062.1 (21)

MUSG0608-33(38)

Lo323 (35)

Jonathan-nairb (34)

STI & Ys favoured genotypes

Preliminary Results

Green house

- Very little vine reduction (less 10%) was observed in ADMARC, Mgcl01, tacna, Naspot, Jonathan, Carrot-c, K135, MUSG0614-22, MUSG0608-33, ligodo, atacana & UKN-Malawi

These genotypes less affect by drought

- Plant survey (More 60 DAP) Mgcl01, tacna, carrot-c, Gueri, Ukerewe, K566632, K118, MUSG0609-47, MUSG0610-45, MUSG0614-24, MUSG0608-61, MUSG0606-2, tainung64, MUSG0608-33, MUSG0622-60, gabagaba, nhacutse4 & UNK-Malawi

Conclusion & Recommendations

- The two methods used in the experiment showed some differents results

Filed trials- showed that drought tolerant genotypes were 199062.1, MUSG0608-33(38) under severe & moderate stress

Green house- Mgcl01, tacna,_UKN-Malawi & MUSG0608-33

More experiments must be conducted in the green houses to consolidate of the results of this experiments

No evaluated variety had better performance in all evaluated parameters

The amount of dry matter and BC did not vary with the different levels of irrigation

Thank you for you attention