Sweetpotato Grafting: New approach of vine conservation in dry areas

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INTRODUCTION

In the tropics sweet potato (*Ipomoea batatus* L.) is propagated by vine cuttings taken from farm-saved plants. However, a pre-longed dry season damages farm-saved stock plants causing a shortage of planting material at the start of planting season. The popular orange fleshed sweet potato (OFSP) cv. 'Resisto' is sensitive to drought and has poor vegetative growth. Therefor, this study was conducted to evaluate the vine growth of "Resisto' grafted on two drought tolerant varieties "Tanzania" and "zapalo" under different water conditions

OBJECTIVES

- To increase planting material availability of OFSP cv 'Resisto' after a long dry season.
- To evaluate vine yield of grafted and ungrafted "Resisto" under different water conditions

METHODS

Drought sensitive Scion cv. 'Resisto' (R) was grafted onto drought tolerant rootstock cvs. 'Zapalo' (Z) and 'Tanzania' (T) by using tongue grafting.. The three types of planting materials (R, RT and RZ) were compared under three refill of measured deficit irrigation levels (MDI) (30%, 60% & 100%). Soil moisture was monitored by neutron probe readings taken from access tubes planted at each plot.

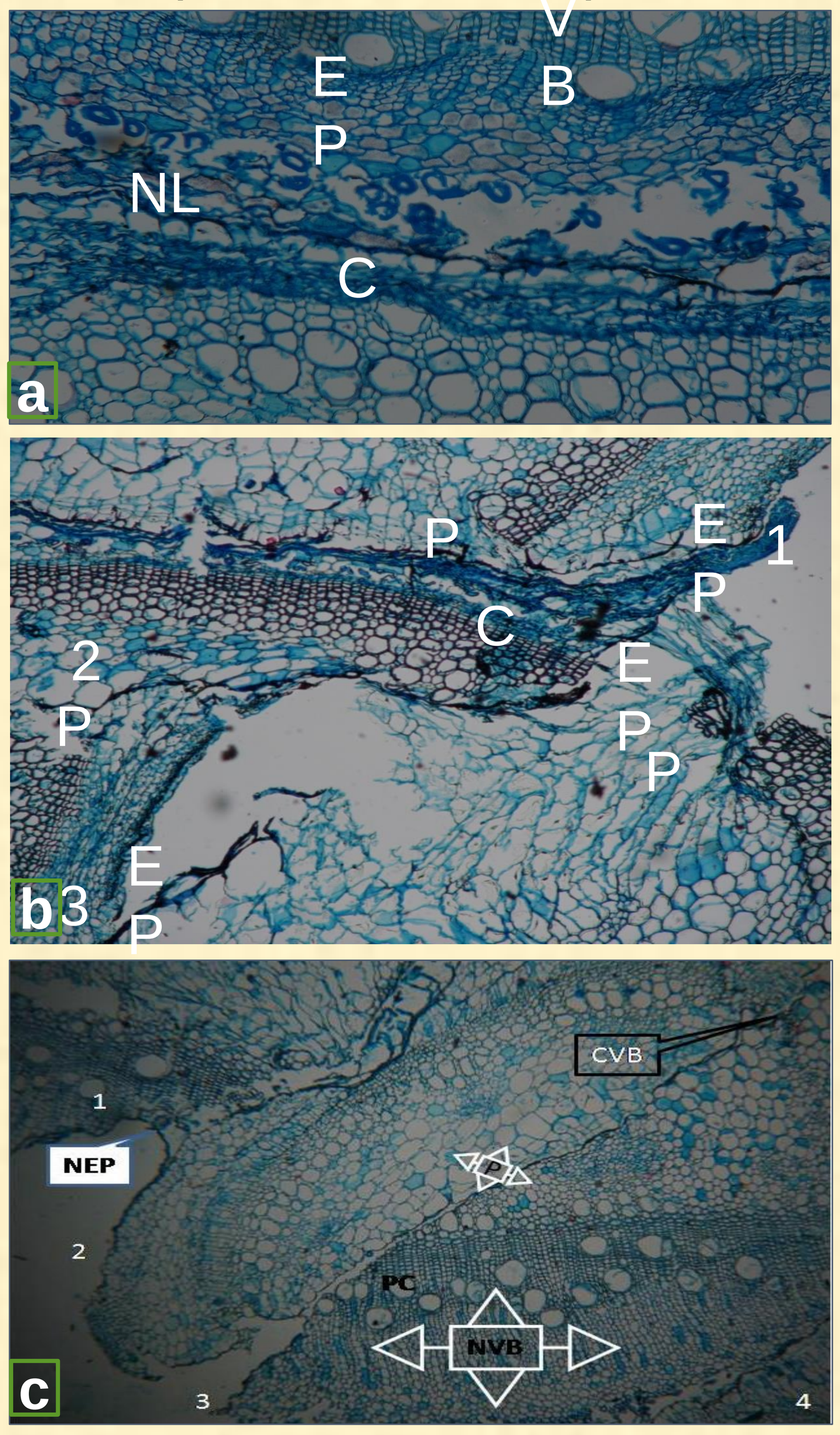

Fig 1: Histological analysis of graft union formation. The method used in the preparation of microscope slides was adapted from (O`brien and McCully ,1981) **(a)** callus proliferation and necrotic layer formation 5 DAG. VB- Vascular bundle, Ep- Epidermal cell, NL- necrotic layer, C- Callus formation, P- parenchyma cells, **(b)** interface of grafted partners at the graft union 16 DAG, 1&4 outer parts of root stock and scion, 2&3 inner parts of root stock and scion **(c)** Development of graft union 23 DAG, NVB- new vascular bundle, PC- pro- cambium, P- common parenchyma cells, CVB- common vascular tissue, NEP- Common epidermal layer formation

Self-rooted Grafted

Fig 2: Field performance of self-rooted and grafted Resisto variety

CONCLUSION

Grafting improved vine yield of drought sensitive OFSP grown under water deficit conditions. The nature of root stock cultivars influenced the vine character of the scion cultivar. Therefore, vines of drought sensitive OFSP cultivars can be maintained over the long drought season by grafting onto vigorous, drought tolerant varieties. The work opens new frontier to study drought resistance in sweetpotato.

RESULTS & DISUCSSION

Graft compatibility: Necrotic layer and callus formation, common parenchyma cell and new vascular tissue development and continuity of epidermal cell were observed on 5th up to 10th , 16th and 23rd days after grafting (DAG) respectively. This shows the varieties were compatible to each other (Fig1a-c).

Biomass production: RT and RZ produced 45% and 21% higher shoot biomass (BM) than R at 30% refill of measured soil water deficit irrigation (Table1 and Fig 2 c - d).

WUE: RT at 30% deficit irrigation showed significantly ($\alpha < 5\%$) higher WUE for above-ground biomass (179.1kgha^{-1}mm^{-1}) and cutting numbers (7091cuttings ha^{-1}mm^{-1}).

Grafting effect on vine characters: grafted 'Resisto' cuttings had higher node number, inter-node length and branch numbers than ungrafted PM (Fig 3).

Table 1: Productivity of grafted and un-grafted plants under different soil moisture deficit conditions

PM type	Deficit	Vine BM (tha-1)	Vine production (cutting per hectare)	WUE	
				BM(kgha^{-1}mm^{-1})	Vine Nº (cuttings ha^{-1}mm^{-1})
R	30%	7.7bc	270370e	98.2bc	3458b
R	60%	7.9bc	298518de	61.3cde	2309b
R	100%	6.6c	242222e	36.5e	1330c
RT	30%	14.1a	558271ab	179.1a	7091a
RT	60%	10.9ab	473703abc	84.6bcd	3699b
RT	100%	12.5ab	612592a	67.56cde	3294b
RZ	30%	9.7abc	309629de	124.8b	4014b
RZ	60%	9.1abc	369259cde	67.5cde	2754bc
RZ	100%	8.4 bc	440864cd	45.27 de	2414bc

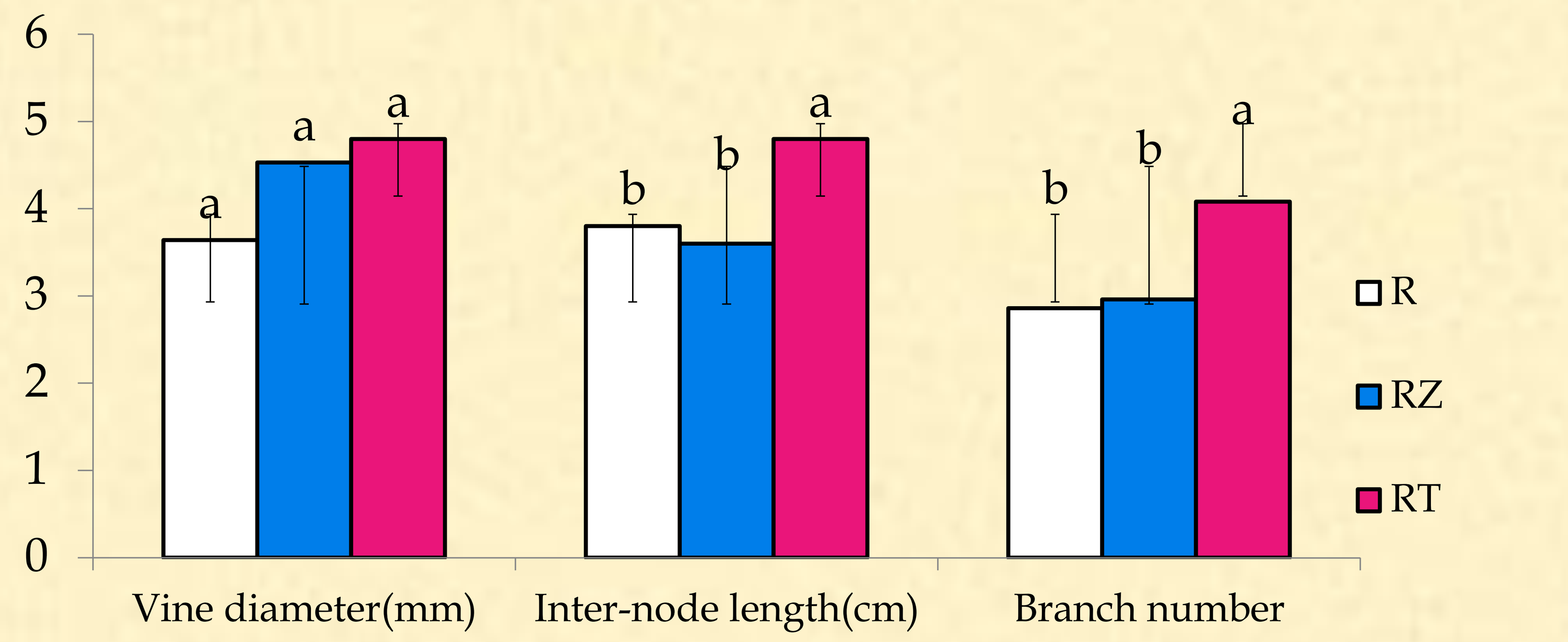

Fig 3: Vine characteristics of cv. 'Resisto' grafted onto 'Zapalo'(RZ) and 'Tanzania' (RT) and ungrafted(R).