Variation and Associations of Cup Quality Traits and CBD Resistance in *Coffea arabica* cv Ruiru 11

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INTRODUCTION

➤ Ruiru 11, a composite cultivar comprising of about 60 F1 hybrid sibs was developed at CRS & released in 1985.

➤ Each sib is derived from a cross between a specific female and male population.

➤ The cultivar is high yielding, resistant to CBD and Leaf Rust and its quality is generally acceptable.

➤ Majority of reported work on coffee breeding primarily concerns agronomic improvement that directly impinges on coffee quality.

➤ However, consumer awareness about the quality of different coffees has increased and selection for disease resistance must also include coffee quality improvement.

CBD Infected Berries

Healthy Berries

Objectives

✓ The aim of this study was to determine the variation and associations of cup quality traits and CBD resistance in Ruiru 11 coffee cultivar.

✓ The study also aimed at selecting specific Ruiru 11 sibs that combines good cup quality with high CBD resistance.

Materials and Methods

Thirty four (34) full-sib families representing Ruiru 11 hybrid cultivar grown in three different agro climatic zones in Kenya were used for the study.

SITE	GPS	ALTITUDE	SOILS	SOIL pH	YEAR PLANTED
Mariene (Meru)	0^0N, 37^0 35'E	1524M	ando-humic acrisols, friable clays	strongly acidic	April 1991
Koru	0^0 07'S, 35^0 16'E	1554M	eutric nitosols, friable clays	weakly acidic to neutral	April 1990
Kisii	0^0 41'S, 34^0 47'E	1700M	molic nitosols, friable clays	acidic	April 1990

Experimental Design: RCBD with three reps

Data Collection

- ✓ Cherry samples picked from May – July 2010. Cherry weighed, wet processed, parchment dried to MC of 10.5 to 11%, hulled and graded appropriately.
- ✓ The samples were roasted to medium roast using a Probat laboratory roaster and then ground using a laboratory grinder (Probat- Type 55 LM 1500).
- ✓ Sensory evaluation procedure described by Lingle (2001) was followed. Seven sensory variables namely; fragrance, flavour, aftertaste, acidity, body, balance and preference; were assessed by a trained panel of seven and rated on a 10-point scale.
- ✓ An overall score (total score) was calculated as the sum of all the seven variables plus 30 points that are normally added to adjust the final score to a 100-point basis.

Evaluation of CBD Resistance

Evaluation of CBD resistance was conducted through hypocotyl inoculation in a CRD laboratory set-up (Van der Vossen *et al.*, 1976).

Highly resistant

All seedlings were inoculated with conidia suspensions from 10 day old cultures standardized to 2×10^6 conidia/ml.

CBD was scored using a scale of 1 (no visible symptoms) to 12 (whole seedling dead).

Highly susceptible

Data Analysis

- ✓ Data analysis was conducted using XLSTAT 2012 statistical software
- ✓ Both sensory and CBD resistance data were subjected to ANOVA and effects declared significant at 5% level.
- ✓ Student-Newman-Keuls (SNK5%) test was used to separate the means.
- ✓ Linear correlation was done to determine the association between the quality traits and CBD resistance.
- ✓ Discriminant Function Analysis (DFA) was also conducted to test whether cup quality could be used to discriminate different Ruiru 11 sibs according to agro-ecological zone.

Results

Multi-site ANOVA for variance for cup quality traits

| Traits | Sib Variations | | | | | | | | Site Variations | | Site x Sib Interactions | |
| | Mariene | | Koru | | Kisii | | Combined | | | | | |
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Fragrance	0.000^{***}	0.002^{**}	0.000^{***}	0.275^{ns}	0.029^{*}	0.014^{*}	0.000^{***}	0.002^{**}	0.000^{***}	0.837^{ns}	0.000^{***}	0.017^{*}
Flavour	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}
Aftertaste	0.072^{ns}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.520^{ns}	0.000^{***}	0.000^{***}	0.000^{***}
Acidity	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}
Body	0.003^{**}	0.081^{ns}	0.393^{ns}	0.131^{ns}	0.535^{ns}	0.596^{ns}	0.069^{ns}	0.096^{ns}	0.000^{***}	0.122^{ns}	0.218^{ns}	0.221^{ns}
Balance	0.000^{***}	0.000^{***}	0.000^{***}	0.001^{***}	0.014^{*}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}
Preference	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}
Total Score	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}	0.000^{***}
DF	35	35	35	35	35	35	35	35	2	2	70	70

Significance: * at 5%, ** at 1%, *** at 0.1%, ns = not significant

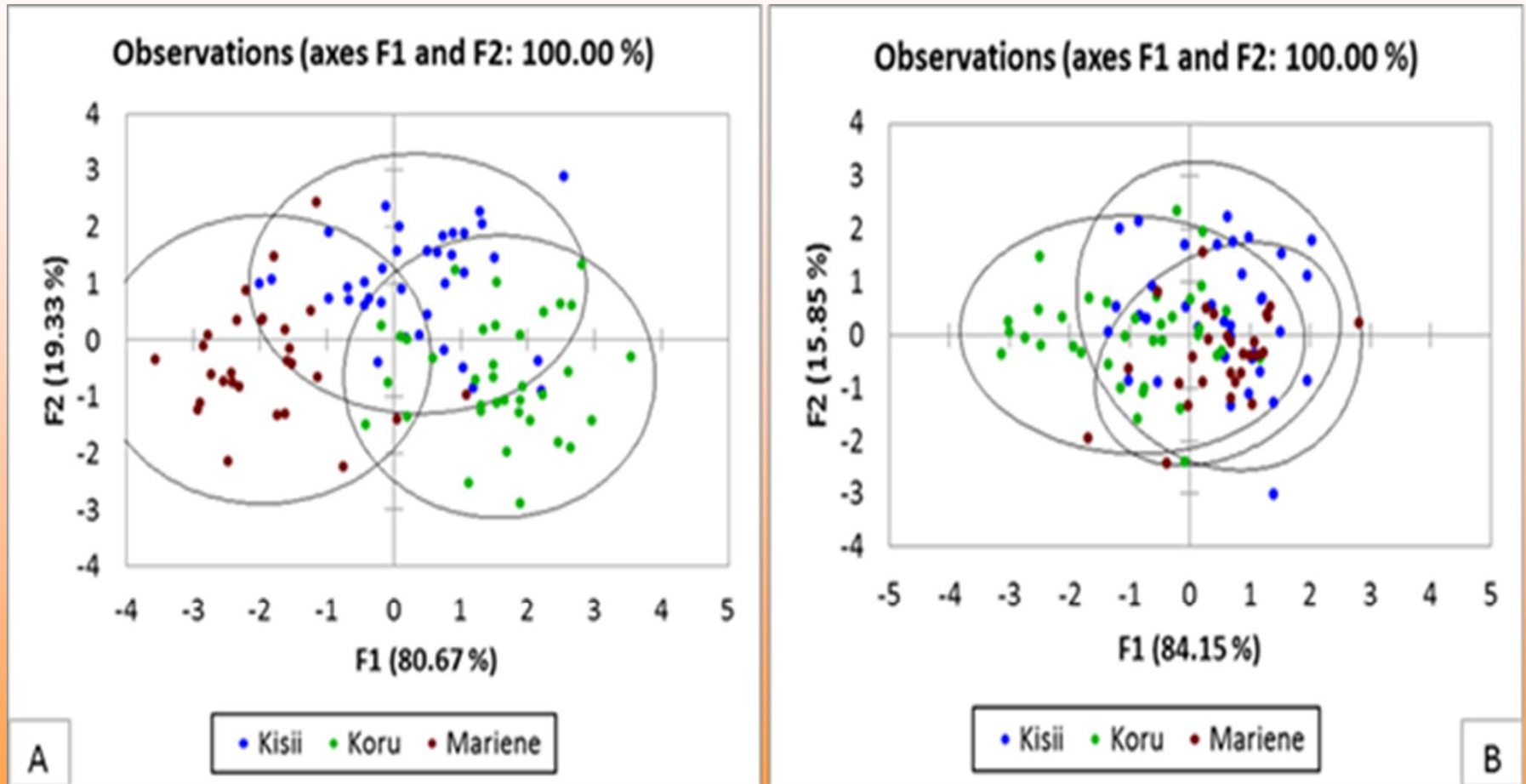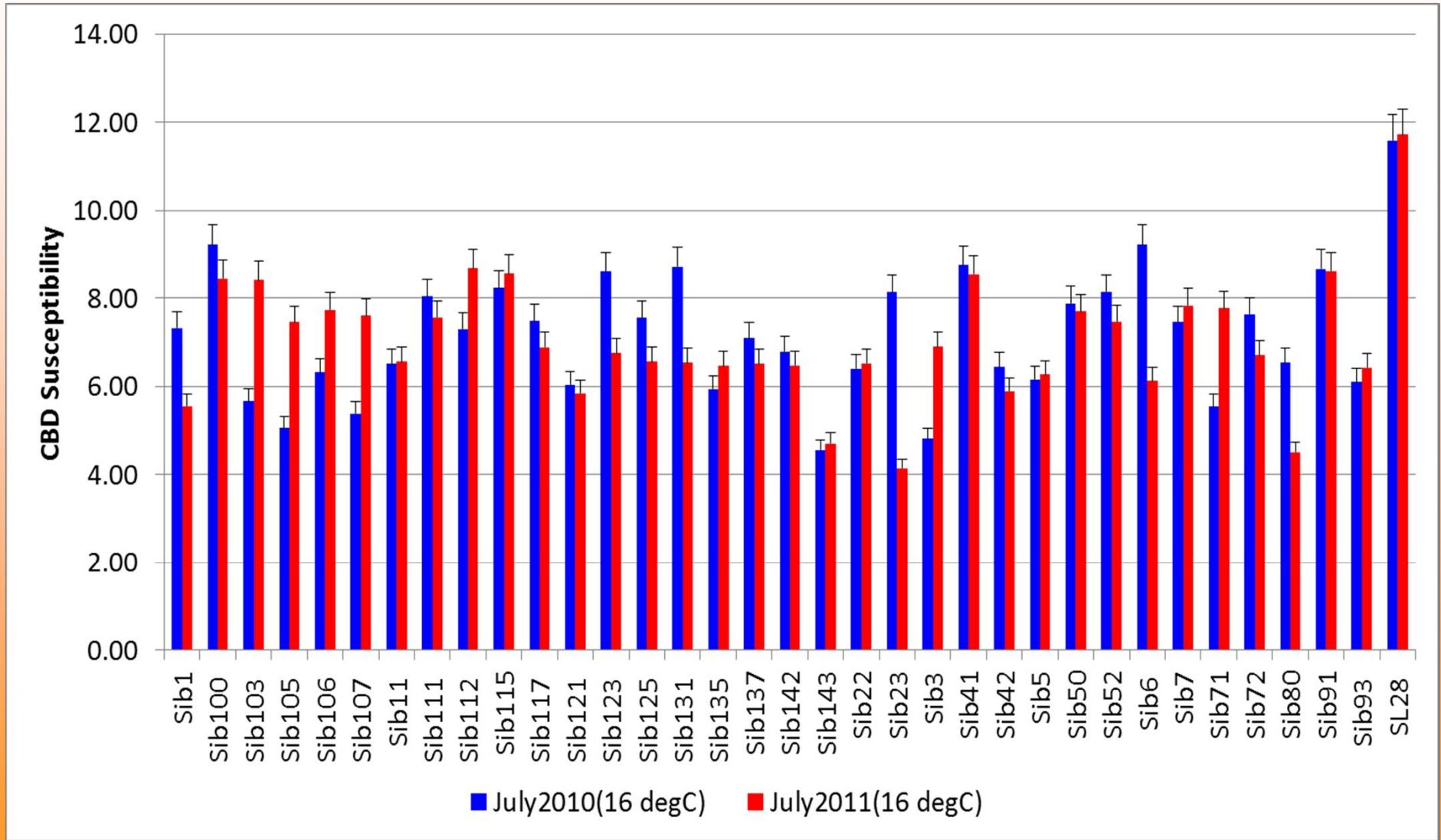# DFA plot depicting location differences

Fig. 1: Discriminant Factor Analysis (DFA) plot depicting location differences. A = 2010 Season; B = 2011 Season

Variation in CBD Resistance/Susceptibility

Pearson Correlation Matrix

2011	Variables	2010								
		Fragrance	Flavour	Aftertaste	Acidity	Body	Balance	Preference	Total score	CBD Score
	Fragrance		0.512	0.486	0.598	0.506	0.589	0.571	0.727	0.137
	Flavour	0.689		0.682	0.782	0.450	0.669	0.750	0.859	0.179
	Aftertaste	0.702	0.880		0.695	0.403	0.662	0.686	0.811	0.110
	Acidity	0.682	0.896	0.861		0.517	0.699	0.839	0.915	0.102
	Body	0.590	0.614	0.596	0.596		0.551	0.572	0.667	-0.006
	Balance	0.685	0.883	0.865	0.872	0.627		0.745	0.841	0.076
	Preference	0.723	0.892	0.871	0.908	0.654	0.868		0.907	0.064
	Total score	0.777	0.949	0.933	0.947	0.706	0.930	0.955		0.116
	CBD Score	0.190	0.066	0.106	0.075	0.098	-0.025	0.102	0.087	

All the blue values are different from 0 with a significance level alpha=0.0001. Values in black are not significantly different from 0.

Relationship between Cup Quality and CBD Resistance
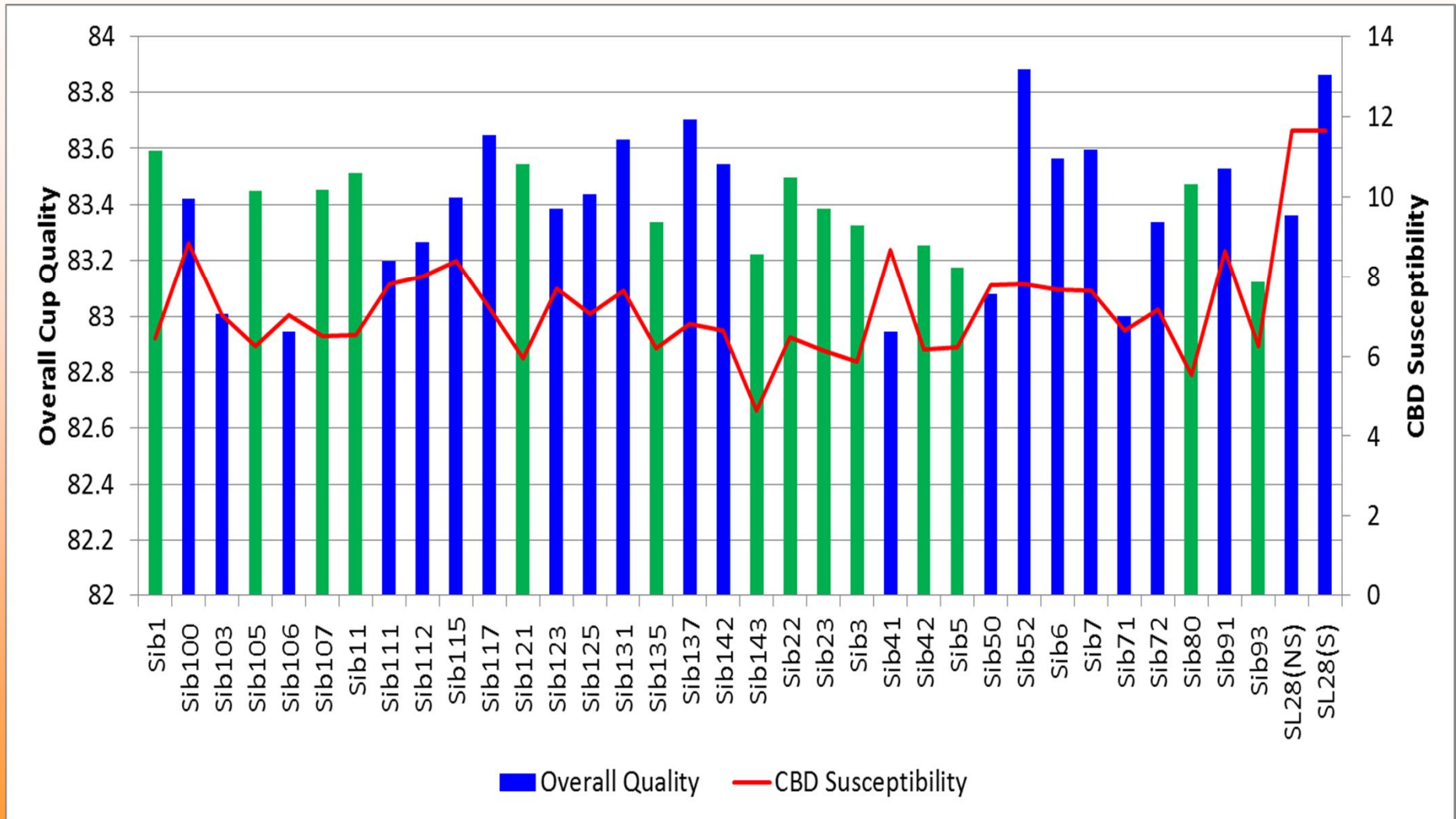
Conclusions

There exists high variation within Ruiru 11 cultivar for cup quality and CBD resistance.

A highly significant positive correlation observed between all cup quality traits indicated that all the 7 quality traits contributes positively to overall cup quality.

There was no correlation between cup quality traits and CBD resistance indicating the possibility of combining good cup quality with high CBD resistance.

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