S1-PO-11

Coffee Genetic Resources in Yemen, Diversity and Importance for Arabica Coffee (Coffea arabica L.) Improvement.

For thousand years coffee has continued sustained cultivation in mountainous areas of Yemen. under very diverse environmental. cultural and climatic conditions. Yemen where coffee drink (قهوة) Qahwah was invented & the words coffee and Coffea arabica descend .Socioeconomic and trade exchange between Yemen and the east African countries has long existed since the early first millennium BC

The objectives of this study were to develop clear morpho-physiological metrics that were repeatable. could be used to differentiate Yemeni coffee landraces YCL & could provide scientific evidence of the genetic diversity of traditional coffee landraces still grown by farmers in Yemen . Experiments were conducted under controlled conditions in greenhouse at Texas A&M Agrilife. College Station. Texas . Seeds of 30 (YCL) and in the occurrence of 21 references cultivars from World Coffee Research collection (WCRC) were planted in February 2014. in pots (Table 1)

Table 30 .1YCL and 21 WCRC were evaluated and 4 plants from each accession were analyzed

Yemeni Coffee Landraces (YCL)			World Coffee Research collection (WCRC)	
ID	Collection site information	Elevation(m)	ID	Cultivars name's and seeds sources
1	Taiz Wadi Tabel-Mirwish	1200	31	Caturra, Plant Natural Genetic
2	Taiz Wadi Tabel-Mawdy	1500	32	Catimor, PNG
3	Taiz Wadi Tabel-Mirwish (Dawairy)	1600	33	Arusha, PNG
4	Hodeidah Sample5 Bernaky Barey	2000	34	Bourbon, PNG
5	Hodeidah Sample7 Bernaky Barey	1800	35	Venecia, Costa Rica
6	IBB Mzaikhrh	800	36	Marsellesa, Nicaragua
7	IBB Wadi Odour (Odain)	700	37	Pacamara, El Salvador
8	IBB Oisimah Abodw Alsukhodrl	1400	38	Lempira, Hondoras
9	IBB Sahban Wadi Rofod	1100	39	Rairu Kenya
10	IBB Oisimah Abodw Alsukhodrl2	1100	40	SL28, Kenya
11	IBB Jabal Sophal Eriane	900	41	K7, Kenya
12	Taiz Wadi Bisobel Bani Hammad	800	42	Batian, Kenya
13	Taiz Wadi Al Dabbah Bani Hamad (Tofahi)	800	43	Oro Azteca, Mexico
14	Taiz Wadi Naierah Bani Hammad	800	44	Geisha, Banama
15	Taiz Wadi Naierah Bani Hammad (Dawairy)	900	45	Typica, Papua New Guinea
16	Taiz Wadi Naierah Bani Hammad (Dawairy)	750	46	Colombia5
17	Taiz Bani Hammad Wadi Dabbah, (Tofahi)	900	47	Colombia4
18	Sanaa, Manakha (Gadi Gofni)	1500	48	Colombia3
19	Sanaa, Manakha	900	49	Colombia2
20	Sanaa, Manakha Maasana	1500	50	Colombia1
21	Sanaa, Manakha Manakha	1000	51	Mundo Novo, PNG
22	Sanaa, Wadi Alboer Asphal Bamimater	1800		
23	Sanaa Wadi Alboer Asfa Bamimater	1800		
24	Hodeidah Bamin Alsharf (Tofahy)	1500		
25	Hodeidah Bamin Alsharef Dawairy	1600		
26	Hodeidah Bamin Alsharef Kobary	1700		
27	Dhamar Bani Fadhl Amin Odaini Gaadi	1100		
28	Dhamar Bani Fadhl Amin Dawairy	1000		
29	Dhamar Bani Fadhl Amin Tofahi	800		
30	Dhamar Bani Fadhl Amin Oil	900		

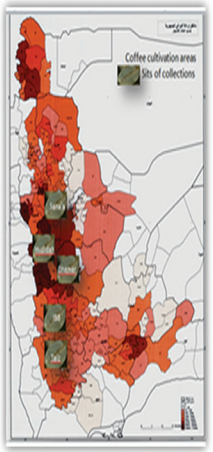


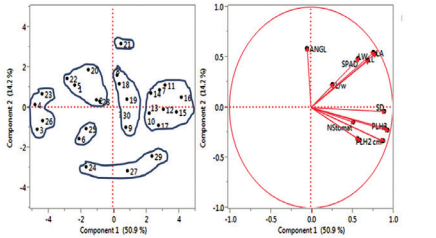
Fig .1 . Sites where YCL collected. ٪30 of coffee cultivation areas

Table 2. Means. standard deviations & range values for morpho -physiological traits assessed under greenhouse .

Morpho-physiological traits (MPhT)	Yemeni Landraces (YL)			World Coffee Research c (WCRC)		
	Mean ± STD	Range values		Mean ± STD	Range values	
		Low	High		Low	High
Plant height (PLH) in cm	48.2±15.7	20	75	37.6±8.9	28	54
Number of nodes (NNod)	13.2 ±1.8	9	15	13.5±1.3	11	16
Stem diameter (SD) at the 1st node in mm	6.8 ±2.4	2	10	7.9±1.4	5	10
1st branches angle (ANGL) for the main stem	47.4 ±7.1	30	65	46.9±9.6	35	71
Leaf area (LA) in cm^2	40.4±13.4	10	70	70.3±24.8	45.3	164.9
Leaf length (LL) in cm	10.1 ±2.01	5	17	13.9±1.9	11.4	19.0
Leaf width (LW) in cm	5.8 ±0.61	4	10	7.2±1.7	5.7	14.4
Leaf length/width (L/W)	1.8 ±0.20	1.45	2.1	1.9±0.21	1.3	2.3
Leaf specific weight (LSW) ($g.dsm^2$),	5.7 ±0.95	1.6	8	5.9±0.69	4.9	7.1
Leaves chlorophyll (SPAD unites)	59.4 ±7.0	43	72	53.5±5.8	45.4	67.1
Stomata numbers (NSTOMAT) per mm^2	139±21.9	94.7	207.3	126.9±11.1	106.7	142.7

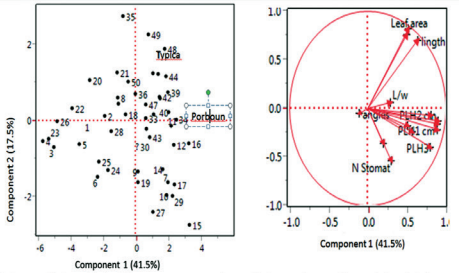
Results depicted that important variations in the most of these morho physiologicals traits. and NSTOMAT variations also noted. This study indicate that there is a potential for tremendous amount of genetic diversity of MPhT in YCL still grown and maintained by farmers in Yemeni mountainous areas. One-year-old plants grown in a common garden environment is really reliable method to detect genetic variations in the collection or in the breed material . These materials can be conserved and evaluated for their productions and performances under field conditions

Fig .2 . PCA conducted in 30 YCL for morphophysiological traits for one-year-old plants



Morpho-physiological results treated by multivariate analyses allowed the separation of 7 groups of landraces. as well as to estimate variations within these groups. reflecting the genetic factors controlling these variations. the environmental effects. and the nature of heterogeneity of these landraces. which explain the traditional way of their evolution and selection process (traditionally practiced by farmers.

Fig .3 . PCA conducted for the whole genetic material YCL&WCRC reveal the genetic diversity of Yemeni landraces domesticated and evolved during the period of cultivation & exploitation



Positive correlations obtained between stomata and growth vigor traits (number and plant height. stem diameter) reflect the role adaptive of stomata and variability of water for irrigation in different agro ecological zones. This explains the negative correlations obtained between NSTOMAT and elevation sites where these samples collected.

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