

Coffee Quality Evaluation of Abe Dongoro District in Horo-Guduru Wollega Zone, Oromia Regional State

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ABSTRACT

Coffee is the major source of foreign currency for Ethiopia and contributes more than 35% of the total export earnings. The objective of the present study was to evaluate the coffee quality of Abe Dongoro District in Horo-Guduru Zone, Oromia Regional State. The coffee samples were collected, prepared and evaluated during the 2016/17 cropping season. Both raw and cup quality parameters were evaluated by a team of certified panelists at Jimma Agricultural Research Center (JARC) coffee processing and quality analysis laboratory and analyzed using completely Randomized Design (CRD). Physical (raw) coffee quality parameters such as Bean shape and make and odor showed no statistically significance difference ($P>0.05$) for all coffee types collected from potential coffee growing kebeles of Abedongoro district. Cup quality parameters such as aromatic intensity and quality, acidity, astringency and bitterness showed no statistically significant difference ($P>0.05$) for all coffee types. In general both physical and cup quality test results of coffee types from selected potential coffee growing kebeles of Abedongoro woreda were commercially acceptable to highly acceptable quality and fit to export market standard by following the recommended all post-harvest practices.

Keywords: Cup quality, raw coffee quality

INTRODUCTION

Coffee quality has critical importance to the coffee industry. Quality coffee is a product that has desirable clean raw and roasted appearance, attractive aroma and good cup taste. Factors that determine coffee quality are numerous. The genotype, climatic conditions, soil characteristics, agricultural practices, harvesting methods and post-harvest processing techniques are the major attributes for deterioration of coffee quality.

The quality of Ethiopian coffee is determined by two main factors namely the geographic origin and the post harvest-processing techniques (Musebe, R.et al 2007). Physical and organoleptic qualities are the most important parameters in the world coffee trade. It is estimated that the quality of coffee is determined by 40% in the field, 40% at post-harvest primary processing, and 20% at export processing and handling including storage (Musebe, R.et al 2007). Coffee quality problems are mainly associated with improper post-harvest processing and handling practices such

as drying on bare ground, improper wet processing, storage and transportation, poor agronomic practices like uncontrolled shade level, lack of stumping, pruning and weeding, poor harvesting practices, such as stripping and collecting dropped fruits from the ground (Nure, 2008).

Though coffee is produced in Abe Dongoro woreda and coffee producer farmer's lack of information regarding to coffee harvesting and post-harvest practice. During the survey time in Abedongoro woreda considering to post-harvest problems is mainly coffee drying practice is very poor. Even if coffee drying is significant factor in quality and market cost attributes of coffee, after harvesting without sorting most coffee producing farmers do not use raised beds rather they used bare ground for drying coffee cherries. Therefore, the objective of the study was to evaluate the quality of seven local landrace with one released coffee (74110) from each eight potential coffee growing kebeles of the woreda and prepared by dry processing method according to the recommended procedure.

MATERIALS AND METHODS

Study Area

Abe-Dongoro District is found in Oromia region, Horo-Guduru Wollega Zone 374 Km away from West of Addis Ababa. The district has 21 potential coffee growing peasant associations from which nine of them produce in high amount. Most of the district lay up on mid to high altitude agro-ecology with altitudinal range of 1300 – 2800 m.a.s.l. The maximum and minimum temperature range from 12 – 32 0C. Annual average rainfall of the district is 1750 – 2750 mm which is very high and bi-modal nature.

Based on district agricultural office total coffee production area coverage is 8666 hectares from which 5142 hectares covered with improved coffee varieties while the remaining 3110 hectares covered with local land race coffee genotype. Up to current year 414 hectares of old land race coffee genotype were stumped. Based on the information from district office from high potential peasant associations/Kebele high amount of coffee produced in good quality. Among them local known coffee type “Lagie” coffee is the re-known best quality land race coffee. Historically coffee came from or originally from Nekemte and Jimma to this woreda.

Experimental Materials

Six kg coffee type samples were collected of the 2016/17 harvesting season at Abedongoro woreda of major growing kebeles such as Garero, Lagie, Lomecha, Gortie, Botoro, Edoboti and Wollegie landraces including released variety (74110). Harvesting was conducted in the period between mid of October and December 2016. Samples were prepared in dry or natural processing method.

DATA COLLECTION

Green Bean (Raw) Coffee Quality Evaluation

The green bean quality parameters were assessed as per standard of JARC (Jimma Agricultural Research Center) coffee processing and quality analysis laboratory manual (Abrar and Nigusie, 2015).

Screen Size of Bean

It was conducted by means of rounded perforated plate called screen (*Jos. Hansen and Soehne Hamburg*). The screen size 14 is of whole diameter of 5.6 mm. Weight fractions of coffee bean retained above screen no.14 were

recorded in percentage, which are defined in the international organization for standards.

Bean Shape and Make

It is the structural make up of different kinds of beans. Shape and make of coffee samples was evaluated by a team of cuppers out of score 15% only for washed coffee as very good (15), good (12), fair good (10), average (8), mixed (6) and small (4) and evaluated accordingly.

Color

It is the overall physical appearance of coffee beans and it was evaluated out of score 15% only for washed coffee as bluish (15), grayish (12), greenish (10), coated (8), faded (6) and white (4) was evaluated accordingly.

Odor

It is the olfaction of coffee beans. It was evaluated out of score 10% for washed coffee as clean (10), fair clean (8), trace (6), light (4), moderate (2) and strong (0).

Roasting and Grinding

The roasting process causes the coffee beans to swell and increase their size by over 50%, while at the same time greatly reducing their weight (Hicks, 2002). Temperature and time are two critical things that have to keep in mind during roasting to obtain better quality coffee. The roaster machine with six cylinders (Probat Welke, Von Gimbom GmbH Co. KJ, Germany) was used for roasting. One-hundred gram of dried green beans from each sample was weighed with a sensitive balance.

The roaster machine was first heated to 200 oC and hundred gram beans per sample was put in to roasting cylinder and roasted for an average of 6-8 minutes to a medium roast under roasting temperature of 200 oC (Abrar et al., 2014). The medium roasted beans were then, tipped out into a cooling tray and allowed immediately to cool down for by blowing cold air over the cooling plate. The roasted and cooled beans were blown to remove the loose silver skin (chaff). About half of hundred gram medium roasted beans of each sample was ground to medium size using electrical coffee grinder (Mahlkonig, Germany) adjusted to 1.5 mm diameter of sieve size. During grinding, the grinder was cleaned well after each sample was ground. In order to avoid the loss of aroma, roasted coffee should be ground immediately before being made for brewing purpose as aroma is quickly lost from ground coffee (Hicks, 2002).

COFFEE BREWS PREPARATION AND CUP QUALITY EVALUATION

According to Jimma coffee processing and quality analysis laboratory manual, three up to five clean standard porcelain cups with 180 ml capacity (Schonwald, Germany) per sample were prepared. Soon after grinding, 8 gram of coffee powder was put into each cup per sample similar to CLU (2007) and ECX (2010). Fresh boiled (93 oC) water was poured into the cup with prepared powder coffee up to about half of the cup. Then, the content of the cup was stirred in order to ensure the homogeneity of the mixture of coffee powder with boiled water in a cup. Before filling cup with fresh boiled water, the volatile aromatic quality and intensity parameters were evaluated by tasting and sniffing, respectively with team of panelists. Then the cup were filled with water to the size (180 ml) and left to settle for about 3 minutes. Then, the floater was skimmed and the brew was ready for panelists within 8 minutes or beverage cooled to around 60 0C (drinkable temp.) for cup coffee quality evaluation (Abrar and Nigussie, 2015). After the preparation of coded brew samples team of three experienced and internationally certified cuppers of Jimma Agricultural Research Center (JARC) were evaluated the following cup quality attributes. Each panelist gave his own judgment value for each coded brewed coffee sample. Finally, the average results of all panelists were used for data analysis. Sensory evaluation was done for all cup quality parameters including, bitterness, astringency, acidity, body, flavor, aromatic intensity and aromatic quality and over all cup quality.

Aromatic Quality

It indicates the perception by the panelist of the character of coffee in the mouth. It was evaluated by scoring out of 5% as unacceptable (0), bad (1), regular (2), good (3), very good (4) and excellent (5).

Aromatic Intensity

It is magnitude of aroma as evaluated by scoring out of 5% as, nil (0), very light (1), light (2), medium (3), strong (4) and very strong (5) ranged from 0 to 5.

Bitterness and Astringency

Both parameters were evaluated out of 5% using scales ranged from 0 to 5. As very strong (0), strong (1), medium (2), light (3), very lights (4) and nil (5).

Acidity

It is a primary coffee taste sensation created from the combined action of acids and Sugar within the coffee bean. It is also the sense of coffee on the tongue in order to identify strength of the brew. It was scored out of 10 % as nil (0), lacking (2), light (4), medium (6), medium pointed (8) and pointed (10).

Body

It is the feeling that the coffee creates in one's mouth. The viscosity, heaviness, thickness, or richness is perceived on the tongue. Thus, it indicates the texture and sensation of coffee in the mouth, which was evaluated by scoring out of 10% as nil (0), very light (2), light (4), medium (6), medium full (8) and full (10).

Flavor

It is the overall perception of the coffee in a mouth. It is the combination of body, acidity and over all taste of the brew. It was evaluated by scoring out of 10% as nil (0), bad (1), fair (4), average (6), good (8) and very good (10).

Overall Cup Quality

It was scored out of 10 % using the following scales, unacceptable (0), bad (2), regular (4), good (6), very good (8) and excellent (10).

STATISTICAL DATA ANALYSIS

Analysis of variance (ANOVA) was computed for each green bean and cup quality parameter data using General Linear Model (GLM) of SAS procedure version 9.0. In order to identify the variability among the treatments least significant difference (LSD) at 5% level of significance used.

RESULTS AND DISCUSSION

Physical Coffee Quality Evaluation

The samples were evaluated for bean screen size (Sc 14 %), color, odor, shape and make of green bean. The physical appearance of the samples was observed. Physical coffee quality parameters such as Bean shape and make and odor showed no statistically significance difference ($P>0.05$) for all coffee types collected from Edoboti, Garero, Lagie, Lomecha, Gortie, Botoro and Wollegie kebeles (Table1). Generally the bean sizes of all collected coffee samples were $>85\%$ when passed through No 14 screen size and accepted for export market standard.

Table1. Physical coffee quality results by Coffee landrace type.

Green bean coffee quality parameters					
Coffee Type	Bean size screen	Shape and make	Color	Odor	RT (40%)
Garero	95.5c	11.75c	12.00b	9.00b	33.75cd
Lagie	96.93b	12.25abc	12.00b	10.00a	34.25bc
Lomecha	96.33b	12.37abc	12.62ab	10.00a	35.00abc
74110 (RV)	94.50d	12.50abc	12.75ab	9.66ab	35.25ab
Gortie	96.20bc	12.25abc	12.25ab	9.56ab	34.50bc
Botoro	98.50a	13.00ab	12.50ab	9.66ab	35.50ab
Edoboti	96.40b	13.25a	13.12a	10.00a	36.37a
Wollegie	96.50b	12.00bc	10.75c	10.00a	32.75d
F test	**	ns	**	ns	**
CV (%)	0.48	6.30	5.80	4.42	2.87
LSD (0.05)	0.37	0.55	0.50	0.35	0.7

*Mean values followed by the same letter with in column are not significant difference ($P \geq 0.05$).

RT = Raw total quality, RV = Released variety

Cup (Organoleptic) Quality Evaluation

The samples were cup tested at JARC by licensed Q-grader cuppers. Research quality evaluation approaches or parameters (aromatic intensity, aromatic quality, acidity, bitterness, body, flavour, overall standard) were considered during the assessment. The cuppers evaluated and agreed that the coffee types collected from Lagie, Edoboti and Wollegie kebeles were pointed acidity, full body balanced with very good flavour as well as very good overall quality standard. The rest coffee types taken from Lomecha, Garero, Botoro and Gortie kebeles were shown medium to pointed acidity, medium to full body balance and good to very good overall standard quality. The Typicity of three coffee types collected from Edoboti, Garero and Lagie kebeles resembles to Limmu flavour (Winey

flavour). Organoleptic coffee quality parameters such as aromatic intensity, Aromatic quality, acidity, astringency and bitterness showed no statistically significant difference ($P > 0.05$) for all coffee types collected from Edoboti, Garero, Lagie, Lomecha, Gortie, Botoro and Wollegie kebeles (Table2). Generally Physical and cup quality test results of coffee types from selected potential coffee growing kebeles of Abedongoro woreda evaluated by JARC cuppers as shown (Table1 and 2) all tested samples have commercially acceptable to highly acceptable cup test quality except coffee types taken from Lomecha kebele. 74110 coffee types also shows very good cup quality and flavour in that Woreda so there is best chance to expand this released varieties due to best quality performance, diseases resistant and high yield.

Table2. Sensory coffee quality by Coffee landrace type

Cup quality parameters											
Coffee Type	AI	AQ	AC	AS	BI	BO	FL	OL	CQ (60%)	TQ (100%)	Typi
Garero	4.00a	4.00a	7.5ab	4.66a	4.66a	7.83a	7.33ab	7.50a	41.16bc	81.16b	winy
Lagie	4.00a	3.66a	8.16ab	4.66a	5.00a	7.83a	8.00a	8.08a	43.41b	83.08ab	winy
Lomecha	3.00b	3.16a	7.00b	4.66a	4.66a	6.33b	6.33b	6.33a	38.16c	76.50c	
74110 (RV)	3.50ab	3.66a	7.50ab	5.00a	4.67a	8.33a	7.66a	7.83a	44.50b	83.50ab	
Gortie	3.33ab	3.33a	7.66ab	4.66a	4.67a	7.83a	8.00a	7.92a	44.41b	82.08ab	
Botoro	3.16b	3.50a	7.33ab	4.67a	4.66a	7.83a	7.66a	7.750a	44.66b	81.66b	
Edoboti	3.66ab	3.33a	8.33ab	5.00a	5.00a	8.16a	8.33a	8.33a	48.83a	86.50a	winy
Wollegie	3.5ab	3.50a	8.50a	4.66a	5.00a	8.00a	8.33a	8.25a	49.41a	82.41ab	
F test	ns	ns	ns	ns	ns	**	**	**	***	*	
CV (%)	12.3	15.61	10.78	10.53	9.53	5.25	8.58	7.03	4.60	3.22	
LSD (0.05)	0.35	0.45	0.68	0.41	0.37	0.33	0.54	0.44	1.66	2.15	

*Mean values followed by the same letter with in column are not significant difference ($P > 0.05$).

Remark: AI- aromatic intensity, AQ- aromatic quality, AC- acidity, AS- astringency, BI- bitterness, BO-body, FL-flavour, OL- overall standard quality, CQ – Cup quality, TQ –Total quality

Typicity - After taste aromatic quality

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