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**Original Research Article**

# Performance Evaluation of Coffee (*coffea arabica* L.) Selections on Growth and Yield in Southern Ethiopia

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**Abstract:** Ethiopia is the center of origin and has a varied genetic foundation for Arabica coffee, but there is still a lack of yield-competitive enhanced varieties, which is why the average productivity in the country is significantly lower than the global average. The average national productivity is quite low as a result. To find high-yielding coffee for commercial usage, it may be helpful to further assess the performance of the top-performing selections for growth and yield characteristics at the full bearing stage. Therefore, it is crucial to create pure line coffee types that are stable, disease resistant, and high yielding in order to close this gap and increase coffee productivity. Thus, the purpose of this study was to assess the genotypes of pure lines coffee for yield and yield components. In order to illustrate the growth and yield characteristics of eleven Arabica pure line coffee genotypes and three standard checks, the experiment was carried out at Awada, Leku, and Wonago. A randomized complete block design (RCBD) with three replications was used to carry out the experiment between 2015 and 2020. Data were gathered on plant height, number of primary branches, number of secondary branches, length of the longest primary branch, number of main stem nodes, stem girth, internode length on the main stem, canopy diameter, number of nodes on longest primary, and yield per hectare. The findings showed that there were differences between the growth features. Total plant height (1.88–3.34 m), stem diameter (2.93–4.42 cm), canopy diameter (153.58–195.17 cm), number of main stem nodes (30.47–42.00), primary branch number (59.93–82.93), secondary branch number (12.97–37.80), average length of primary branches (92.50–116.10 cm), and number of nodes on longest primary (18.43–29.07) at Awada. Stem diameter (2.78–4.20 cm), canopy diameter (171.19–216.33 cm), number of main stem nodes (29.27–34.93), inter node length on the main stem (4.99–6.77 cm), number of primary branches (55.67–119.67), number of secondary branches (37.80–76.53), average length of primary branches (90.73–125.07 cm), and number of nodes on longest primary (22.27–61.67) of the plant are all measured at Leku. The number of main stem nodes (27.02-31.13), inter node length on the main stem (6.82 - 14.83 cm), number of primary branches (54.00 - 60.93), number of secondary branches (10.73 - 23.73), average length of primary branches (90.20 - 102.40 cm), stem diameter (2.97 - 3.64 cm), canopy diameter (149.67 - 202.17 cm), and number of nodes on longest primary (20.00 - 25.40) are all measured at Wonago. According to the study's findings, pure line selection 9634 (1684 kg/ha) had the highest overall yield per hectare, followed by 9615 (1671 kg/ha) and 85298 (902 kg/ha), which had the lowest. Awada, Leku and Wonago, there will be a better probability of getting improved pure line Arabica coffee varieties inside south Ethiopian producing climate. To suggest an appropriate and stable pure line variety for coffee growers in the South, the experiment should be conducted again at a different representative trial site.

**Keywords:** Arabica Coffee, *Coffee Selection, Growth Characters, Yield*.

## 1. INTRODUCTION

According to a pre-phylogenetic circumscription, coffee is a member of the Rubiaceae family and the genus Coffea L., which includes 104 species that are indigenous to the forests and scrublands of Madagascar, tropical Africa, and the Mascarene Islands in the Indian Ocean [1]. More than half of the foreign exchange revenues of certain sub-Saharan African coffee-producing nations, such as Uganda, Ethiopia, Rwanda, and Burundi, come from the sale of this commodity [2]. The tetraploid species coffee Arabica provides over 75% of the coffee consumed worldwide. It is indigenous to Ethiopia's moist highland woodlands, where it thrives. Coffee is grown organically

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in Ethiopia since most of it is grown in family gardens, semi-forests, and forests with little to no usage of inorganic chemicals and fertilizers. In terms of economics, coffee still accounts for 25–40% of national exports, depending on global market prices [3, 4]. Additionally, the production, processing, and marketing of coffee directly or indirectly support around 25% of the population [5]. Ethiopian Arabica coffee germplasm resources have a significant degree of genetic variability [6, 7]. This is because coffee develops in Ethiopia under a wide range of agro-ecological conditions, species changes or evolutionary tendencies, and natural mutations that affect the crop's population [8]. The national average coffee production per unit area is generally low (approximately 750 kg/ha) [9], which is half of that attained in Latin America and nearly one-third of Asia's productivity [10], despite Ethiopia's great genetic variety, various and compatible agro-ecologies, and suitable land mass. This low yield is ascribed to the absence of stable, disease-resistant, high-yielding Arabica coffee types that are widely adapted to a variety of environmental conditions in the nation [11]. Numerous researchers have published various findings that indicate strong genotype-environment interactions for coffee yield [12].

Due to environmental factors including soil, temperature, humidity, and rainfall, a variety may adapt and satisfy economic interests in one coffee-growing region but not be acceptable for usage in another; hence, a variety needs to be matched to or adapted to a region [13]. In Ethiopia, the selection and breeding process is tailored for each locality using local landraces and crosses from the specific place in order to reduce adaptation issues and prevent the blending impacts of coffee from known quality growing areas with coffee from another area or locations. Similar to this, southern Ethiopia is one of the best places to cultivate high-quality coffee. Research is being done at the Awada Agricultural Research Sub Center and its trial sites to create coffee types that are suitable for the region's growing conditions. In order to ascertain the growth traits and yield performance of coffee selections in the southern region of Ethiopia, this experiment was carried out.

## 2. MATERIAL AND METHODS

### 2.1. Description of the Study Area

The experiment was carried out at Leku and Wonago trial sites substation and the Awada Agricultural Research Sub-Center (AARSC). The mid-highland agroecology of Awada (AARSC) is tepid to cool semi-arid. Situated in the Sidama Region, approximately 43 kilometers south of Hawassa and 315 kilometers south of Addis Ababa, at 603' N latitude and 380 E longitude, and at an elevation of roughly 1750 m.a.s.l., it is close to Yirgalem town. With two wet and dry seasons and an average annual precipitation of 1342 mm, the area has a semi-bimodal rainfall pattern [17]. The average air temperature is 11.00°C at the least and 28.40°C at the maximum every year. The sub-center's primary soil types are chromotic-cambisols and eutric-nitosols, both of which are excellent for growing coffee [25]. The testing locations at Leku and Wonago are situated at 1805 and 1890 meters above sea level, respectively. In terms of the coffee-growing agroecology in the southern regions of the country, the experimental site (Awada) is classed as mid-altitude, while the remaining experimental sites, Leku and Wongo, are classified as high land [17].

### 2.2. Experimental Treatment and Design

Three standard checks (Angafa, Feyata, and 74112) cultivars and eleven Arabica coffee choices (961, 9615, 9616, 9621, 9633, 9634, 9642, 9650, 9737, 11305, and 85298) with southern Ethiopian origin were employed as a treatment. A randomized complete block design (RCBD) with three replications was used to plant normal and healthy seedlings in experimental plots. Each plot included 20 trees spaced 2 m by 2 m apart. As advised, all standard management procedures were rigorously and consistently implemented for every plot [19].

### 2.3. Data Collection

The following quantitative characters' data were gathered: Plant height (cm): measured with a meter tape from ground level to the tip of the apical shoot. Primary branch count: each tree's total number of primary branches was determined. Secondary branch count: each tree's total number of secondary branches was counted. Tree diameter was measured from east to west, then added to the south-north diameter and divided by two to get the canopy diameter (cm). When TH is the overall height, HFPB is the height up to the first primary branch, and NN is the number of nodes on the main stem, the internodes length (cm) is calculated as (TH−HFPB)/(NN−1). The number of nodes on the main stem was counted in order to determine the number of main stem nodes. The first major branch's length (in centimeters) is the distance between the main stem and the branch's tip. The number of nodes on the longest primary branch was counted in order to record this character. Using a pocket meter, the length of the longest primary branch was measured in millimeters. Yield (kg/ha): Clean coffee bean yield was calculated by harvesting fresh cherries from every plant in the plot.

### 2.4. Statistical Data Analysis

Analysis of variance (ANOVA), a Proc GLM technique of SAS version 9.2 statistical software, was used to evaluate all of the data. The Duncan's Multiple Range Test (DMRT) was used to calculate the difference between treatment means at a 5% probability level [15].

## 3.0. RESULT AND DISCUSSION

### 3.1. Growth Characters and Clean Coffee Bean Yield

#### 3.1.1. Growth Characters

Tables 1, 2, and 3 show the results of all the growth parameters that were recorded for Awada, Leku and Wonago, respectively. Overall plant height (1.88–

3.34 m), stem diameter (2.93–4.42 cm), canopy diameter (153.58–195.17 cm), number of main stem nodes (30.47–42.00), inter node length on the main stem (4.18–5.01 cm), number of primary branches (59.93–82.93), number of secondary branches (12.97–37.80), average length of primary branches (92.50–116.10 cm), and number of nodes on longest primary (18.43–29.07) are among the morphological and growth characteristics analyzed at Awada and are detailed in Table 1.

The plant's overall height (1.89–2.56 m), stem diameter (2.78–4.20 cm), canopy diameter (171.19–216.33 cm), number of main stem nodes (29.27–34.93), inter node length on the main stem (4.99–6.77 cm), number of primary branches (55.67–119.67), number of secondary branches (37.80–76.53), average length of primary branches (90.73–125.07 cm), and number of nodes on longest primary (22.27 – 61.67) are all displayed in Tables 2 of the morphological and growth characteristics analyzed at Leku. The plant's overall height (1.24–1.86 m), stem diameter (2.97–3.64 cm), canopy diameter (149.67 – 202.17 cm), number of main stem nodes (27.02- 31.13), inter node length on the main stem (6.82 – 14.83 cm), number of primary branches (54.00 – 60.93), number of secondary branches (10.73 – 23.73), average length of primary branches (90.20 – 102.40 cm), and number of nodes on the longest primary (20.00 – 25.40) are all displayed in Tables 3 of the morphological and growth characteristics analyzed at Wonago. There is a great opportunity to greatly progress the future coffee variety creation program through selection-breeding because there is adequate variance among the materials under examination. This study's substantial difference for the quantitative qualities that were measured was consistent with other authors' findings [18-26].

**Table 1: Mean growth characteristics of coffee selections at Awada**

| Genotypes | Height (cm) | Canopy diameter(cm) | stem diameter (cm) | Number of nodes on the main stem(no) | Inter node length on the main stem (cm) | Number of primary branch(no.) | Number of secondary branch(no.) | Length of longest primary(cm) | No of nodes on longest primary (no.) |
|---|---|---|---|---|---|---|---|---|---|
| 9650 | 232.60 | 188.42 | 3.97 | 36.20 | 4.92 | 71.20 | 14.09 | 114.73 | 25.33 |
| 9633 | 230.67 | 181.38 | 3.78 | 39.28 | 4.69 | 75.07 | 22.87 | 99.63 | 27.27 |
| 9621 | 211.67 | 191.92 | 3.53 | 37.97 | 4.21 | 75.47 | 16.40 | 106.83 | 25.83 |
| 9616 | 216.67 | 195.17 | 3.00 | 41.60 | 4.40 | 78.23 | 16.90 | 99.83 | 21.90 |
| 961 | 224.57 | 188.25 | 3.72 | 35.20 | 4.70 | 69.80 | 12.97 | 116.10 | 23.33 |
| 9615 | 209.07 | 190.17 | 4.42 | 41.93 | 4.38 | 82.67 | 27.47 | 105.70 | 25.43 |
| 9642 | 234.50 | 163.25 | 3.42 | 36.87 | 5.01 | 72.63 | 22.93 | 117.83 | 23.70 |
| 11305 | 208.17 | 177.83 | 3.32 | 42.00 | 4.36 | 82.93 | 30.63 | 99.27 | 29.07 |
| 9634 | 223.33 | 156.55 | 3.41 | 36.13 | 4.35 | 71.53 | 17.10 | 111.00 | 19.83 |
| 9737 | 194.58 | 153.58 | 2.93 | 36.40 | 4.81 | 72.27 | 37.80 | 93.10 | 24.83 |
| 85298 | 215.17 | 180.83 | 3.38 | 34.33 | 4.51 | 67.47 | 14.20 | 94.57 | 22.57 |
| **Checks** | | | | | | | | | |
| Feyate | 230.27 | 193.83 | 3.94 | 39.78 | 4.81 | 70.50 | 18.00 | 100.63 | 24.27 |
| Angeffa | 220.33 | 182.52 | 3.00 | 35.93 | 4.73 | 71.83 | 38.43 | 104.83 | 23.77 |
| 74112 | 188.10 | 159.46 | 3.14 | 30.47 | 4.18 | 59.93 | 15.47 | 92.50 | 18.43 |
| Lsd (5%) | 42.99 | 33.67 | 0.93 | 9.33 | 0.80 | 35.10 | 19.64 | 26.76 | 6.61 |
| Cv (%) | 11.79 | 11.22 | 15.99 | 14.85 | 10.45 | 27.20 | 53.69 | 15.32 | 16.43 |

**Table 2: Mean growth characteristics of coffee selections at Leku location**

| Genotypes | Height (cm) | Canopy diameter (cm) | stem diameter (cm) | Number of nodes on the main stem(no.) | Inter node length on the main stem (cm) | Number of primary branch(no.) | Number of secondary branch(no.) | Length of longest primary(cm) | No of nodes on longest primary (no.) |
|---|---|---|---|---|---|---|---|---|---|
| 85298 | 240.67 | 211.00 | 4.07 | 33.93 | 5.32 | 62.87 | 54.07 | 121.33 | 28.07 |
| 9621 | 239.33 | 202.33 | 3.53 | 30.73 | 6.13 | 60.87 | 36.93 | 119.33 | 26.53 |
| 9633 | 236.33 | 213.00 | 3.89 | 29.07 | 5.33 | 63.40 | 49.20 | 121.33 | 28.27 |
| 9737 | 243.33 | 217.33 | 3.81 | 29.53 | 6.77 | 59.60 | 44.80 | 124.00 | 28.33 |
| 9634 | 246.67 | 213.67 | 4.13 | 31.00 | 5.63 | 61.73 | 36.87 | 125.07 | 28.33 |

| Genotypes | Height (cm) | Canopy diameter (cm) | stem diameter (cm) | Number of nodes on the main stem(no.) | Inter node length on the main stem (cm) | Number of primary branch(no.) | Number of secondary branch(no.) | Length of longest primary(cm) | No of nodes on longest primary (no.) |
|---|---|---|---|---|---|---|---|---|---|
| 9615 | 241.00 | 214.67 | 4.20 | 34.93 | 6.00 | 119.67 | 63.00 | 124.67 | 29.20 |
| 11305 | 256.33 | 212.00 | 3.72 | 33.67 | 5.91 | 65.93 | 43.60 | 122.67 | 26.73 |
| 9616 | 229.33 | 207.00 | 3.77 | 29.27 | 5.83 | 57.60 | 36.07 | 118.67 | 26.73 |
| 9650 | 226.33 | 206.00 | 3.84 | 30.13 | 6.00 | 59.73 | 34.93 | 121.33 | 27.13 |
| 961 | 250.33 | 209.00 | 3.81 | 33.47 | 5.37 | 66.00 | 44.20 | 117.33 | 26.73 |
| 9642 | 188.67 | 171.90 | 2.78 | 29.47 | 4.99 | 55.67 | 38.53 | 98.67 | 22.27 |
| **Cheks** | | | | | | | | | |
| Angeffa | 229.67 | 215.67 | 4.08 | 30.73 | 5.47 | 60.93 | 52.93 | 122.00 | 28.87 |
| Feyate | 226.33 | 207.00 | 3.67 | 31.33 | 6.40 | 61.60 | 37.80 | 121.33 | 27.73 |
| 74112 | 237.00 | 215.67 | 4.09 | 32.00 | 5.26 | 63.60 | 76.53 | 90.73 | 61.67 |
| LSD (5%) | 25.69 | 13.75 | 0.39 | 2.90 | 1.10 | 39.20 | 26.92 | 25.87 | 26.00 |
| CV (%) | 6.51 | 3.93 | 6.16 | 5.48 | 11.42 | 35.57 | 34.58 | 13.09 | 52.06 |

**Table 3: Mean growth characteristics of coffee selections at Wonago location**

| Genotypes | Height (cm) | Canopy diameter (cm) | stem diameter (cm) | Number of nodes on the main stem(no.) | Inter node length on the main stem (cm) | Number of primary branch(no.) | Number of secondary branch(no.) | Length of longest primary(cm) | No of nodes on longest primary (no.) |
|---|---|---|---|---|---|---|---|---|---|
| 85298 | 150.33 | 184.73 | 3.30 | 27.20 | 8.61 | 54.00 | 21.93 | 93.00 | 20.53 |
| 9650 | 152.87 | 192.97 | 3.64 | 30.13 | 7.77 | 59.07 | 19.93 | 98.93 | 20.40 |
| 961 | 135.33 | 191.33 | 3.31 | 27.80 | 9.19 | 54.53 | 20.73 | 93.47 | 20.53 |
| 9642 | 169.67 | 196.67 | 3.55 | 29.33 | 9.13 | 58.20 | 23.73 | 90.20 | 22.73 |
| 9616 | 162.20 | 187.00 | 3.45 | 28.33 | 8.73 | 56.27 | 21.53 | 98.33 | 23.53 |
| 9633 | 149.33 | 188.17 | 3.43 | 29.53 | 14.83 | 57.27 | 18.20 | 91.20 | 23.07 |
| 9621 | 171.00 | 191.50 | 3.57 | 29.07 | 8.91 | 57.40 | 22.27 | 96.27 | 23.60 |
| 9737 | 143.80 | 189.33 | 3.44 | 27.67 | 8.49 | 54.80 | 23.47 | 94.27 | 24.07 |
| 9634 | 157.67 | 192.47 | 3.57 | 28.73 | 7.71 | 56.80 | 22.53 | 99.13 | 22.87 |
| 9615 | 186.33 | 198.17 | 3.33 | 31.13 | 7.97 | 60.93 | 21.47 | 102.40 | 22.73 |
| 11305 | 165.67 | 202.17 | 3.43 | 28.40 | 6.82 | 56.40 | 16.60 | 101.93 | 24.00 |
| **Checks** | | | | | | | | | |
| Angeffa | 175.80 | 191.67 | 3.20 | 29.60 | 8.41 | 58.27 | 23.27 | 94.60 | 20.60 |
| 74112 | 124.33 | 149.67 | 2.97 | 30.47 | 8.32 | 59.73 | 10.73 | 91.27 | 20.00 |
| Feyate | 152.53 | 197.67 | 3.61 | 27.73 | 9.11 | 55.33 | 20.67 | 99.67 | 25.40 |
| LSD (5%) | 31.99 | 11.50 | 0.75 | 2.94 | 6.62 | 5.15 | 6.12 | 9.59 | 6.17 |
| CV (%) | 12.14 | 3.62 | 13.20 | 6.06 | 44.55 | 5.39 | 17.79 | 5.95 | 16.39 |

### 3.1.2. Clean Coffee Bean Yield

According to the individual site analysis, 9634 produced the highest three-year mean yield (2329 kg/ha), whereas 85298 at Awada had the lowest three-year mean yield (1156 kg/ha). Feyate produced the lowest yield of 1413 kg/ha at Awada, while Angafa recorded the highest three-year mean yield of 1646 kg/ha among the standard tests. The Leku site's mean yield data results show that 9633 had the highest three-year mean yield (1661 kg/ha), while 74112 had the lowest three-year mean yield (560 kg/ha). Feyate had the highest three-year mean yield of 1398 kg/ha among the standard tests, whereas 74112 had the lowest yield at Leku, 560 kg/ha. The Wonago site's mean yield data results show that 9615 had the highest three-year mean yield (1749 kg/ha), while 85298 had the lowest three-year mean yield (672 kg/ha). Feyate had the highest three-year mean yield of 1579 kg/ha among the standard checks, whereas Angafa produced the lowest yield at Wonago, 1308 kg/ha (Table 4). In the future coffee development program, the occurrence of adequate variety among the analyzed materials presents a huge chance to bring about significant improvement through selection-breeding. The substantial yield variation found in this study was consistent with the findings of previous

authors who documented high genetic diversity in arabica coffee for growth, disease resistance, and yield [21-24]. Given that genotypes typically react differently to their surroundings, the yield discrepancy may be explained. According to the study of [16], they are a potential variable that causes genotype by environment interaction, and only genotypes that have broad adaption across such settings produce stability.

**Table 4: Mean clean coffee yield (Qt/ha) of coffee selection and their standard checks at Awada, Leku and Wonago locations**

| Treatments | Awada | | | | Leku | | | | Wonago | | | | Over location mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2018 | 2019 | 2020 | Means | 2018 | 2019 | 2020 | Means | 2018 | 2019 | 2020 | Means | |
| 961 | 26.13 | 4.84 | 33.45 | 21.47 | 14.45 | 6.77 | 25.4 | 15.54 | 14.76 | 5.02 | 14.513 | 11.43 | 16.15 |
| 9615 | 26.81 | 8.33 | 26.083 | 20.41 | 11.17 | 5.16 | 20.36 | 12.23 | 10.73 | 15.96 | 25.78 | 17.49 | 16.71 |
| 9616 | 19.34 | 10.92 | 24.28 | 18.18 | 11.07 | 7.04 | 18.433 | 12.18 | 8.09 | 8.85 | 18.903 | 11.95 | 14.10 |
| 9621 | 17.31 | 11.41 | 18.02 | 15.58 | 8.67 | 5.79 | 21.053 | 11.84 | 14.27 | 7.53 | 16.077 | 12.63 | 13.35 |
| 9633 | 19.66 | 5.84 | 27.073 | 17.53 | 15.44 | 5.21 | 29.18 | 16.61 | 16.22 | 5.75 | 23.753 | 15.24 | 16.46 |
| 9634 | 23.52 | 11.52 | 34.84 | 23.29 | 5.86 | 4.07 | 21.27 | 10.40 | 15.74 | 7.99 | 26.757 | 16.83 | 16.84 |
| 9642 | 23.29 | 8.07 | 16.887 | 16.08 | 11.50 | 7.07 | 21.83 | 13.47 | 11.66 | 6.90 | 15.96 | 11.51 | 13.69 |
| 9650 | 24.08 | 5.71 | 20.477 | 16.76 | 12.16 | 3.73 | 21.46 | 12.45 | 16.90 | 6.07 | 21.347 | 14.77 | 14.66 |
| 9737 | 21.29 | 5.35 | 13.403 | 13.35 | 11.45 | 7.28 | 20.267 | 13.00 | 12.30 | 4.58 | 17.397 | 11.43 | 12.59 |
| 11305 | 22.15 | 7.20 | 21.997 | 17.12 | 13.41 | 5.93 | 23.017 | 14.12 | 16.52 | 5.39 | 29.903 | 17.27 | 16.17 |
| 85298 | 10.96 | 0.59 | 23.123 | 11.56 | 7.61 | 0.71 | 18.03 | 8.78 | 6.99 | 3.33 | 9.833 | 6.72 | 9.02 |
| **Checks** | | | | | | | | | | | | | |
| 74112 | 16.89 | 5.81 | 25.51 | 16.07 | 1.57 | 0.20 | 15.02 | 5.60 | 11.37 | 5.25 | 26.657 | 14.43 | 12.03 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feyate | 11.33 | 10.32 | 20.747 | 14.13 | 12.49 | 5.80 | 23.67 | 13.98 | 12.91 | 11.88 | 22.57 | 15.79 | 14.63 |
| Angeffa | 21.45 | 5.12 | 22.803 | 16.46 | 8.38 | 6.98 | 16.633 | 10.66 | 9.15 | 8.55 | 21.543 | 13.08 | 13.40 |
| LSD (%) | 12.19 | 6.00 | 11.85 | 4.88 | 8.26 | 3.11 | 6.19 | 4.18 | 5.42 | 4.23 | 12.6 | 5.67 | 2.80 |
| CV (%) | 35.77 | 49.50 | 30.07 | | 47.45 | 36.21 | 17.46 | | 25.44 | 34.25 | 36.12 | | |

## 4. SUMMARY AND CONCLUSION

Ethiopia's economy depends heavily on coffee. About 15 million Ethiopians, or four million smallholder families, or sixteen percent of the country's total population, depend on coffee production for their livelihood. Coffee is the main source of income for a large number of these growers. Therefore, increasing productivity and production is crucial to helping coffee growers. In order to ascertain the growth traits and yield performance of coffee genotypes, the current experiment was carried out. In order to discover high-yielding selections for commercial use, it may be helpful to further assess the performance of the top-performing coffee selections for growth and yield characteristics at full bearing stage. To determine and suggest Arabica coffee selection genotypes for coffee-growing regions in southern Ethiopia, growth traits and yield performance were considered. Thus, in the Awada growing environment, Arabica coffee selection 9634 (2329 kg/ha) and 9615 (2608 kg/ha) outperformed the existing improved varieties Angafa (2280 kg/ha), while in the Leku growing environment, selection 9633 (1661 kg/ha) and 961 (1554 kg/ha) outperformed the existing improved check varieties Feyate (1398 kg/ha). Furthermore, under Wonago growing conditions, selections 9615 (1749 kg/ha) and 9634 (1683 kg/ha) outperformed the current enhanced check variety Feyate (1579 kg/ha). As a result, the likelihood of obtaining better Arabica coffee types for the growing conditions in Awada and Leku is higher. The Arabica coffee selection 9634 (1684 kg/ha) and 9615 (1671 kg/ha) outperformed the current enhanced variety Feyata (1463 kg/ha) in terms of overall genotype performance throughout the three locations. Although coffee populations in southern Ethiopia have a great deal of potential, little has been done to take advantage of this potential in terms of germplasm diversity in order to create superior pure-line selections for the region. The current study made it abundantly evident that selection breeding might result in notable improvements. In order to create higher-yielding and better-performing coffee choices for the region, a continuous selection procedure is necessary to obtain a large number of genotypes for thorough and in-depth evaluation.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

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