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Variation among East Wollega Coffee (Coffea arabica L.) Landraces for Quality Attributes

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Abstract : Coffee quality improvement program is becoming the focus of coffee research, as the world coffee consumption pattern shifted to high-quality coffee. However, there is limited information on the genetic variation of C. Arabica for quality improvement in potential specialty coffee growing areas of Ethiopia. Therefore, this experiment was conducted with the objectives of determining the magnitude of variation among 105 coffee accessions collected from east Wollega coffee growing areas and assessing correlations between the different coffee qualities attributes. It was conducted in RCRD with three replications. Data on green bean physical characters (shape and make, bean color and odor) and organoleptic cup quality traits (aromatic intensity, aromatic quality, acidity, astringency, bitterness, body, flavor, and overall standard of the liquor) were recorded. Analysis of variance, clustering, genetic divergence, principal component and correlation analysis was performed using SAS software. The result revealed that there were highly significant differences ($P<0.01$) among the accessions for all quality attributes except for odor and bitterness. Among the tested accessions, EW104 /09, EW101 /09, EW58/09, EW77/09, EW35/09, EW71/09, EW68/09, EW96 /09, EW83/09 and EW72/09 had the highest total coffee quality values (the sum of bean physical and cup quality attributes). These genotypes could serve as a source of genes for green bean physical characters and cup quality improvement in Arabica coffee. Furthermore, cluster analysis grouped the coffee accessions into five clusters with significant inter-cluster distances implying that there is moderate diversity among the accessions and crossing accessions from these divergent inter-clusters would result in hetrosis and recombinants in segregating generations. The principal component analysis revealed that the first three principal components with eigenvalues greater than unity accounted for 83.1% of the total variability due to the variation of nine quality attributes considered for PC analysis, indicating that all quality attributes equally contribute to a grouping of the accessions in different clusters. Organoleptic cup quality attributes showed positive and significant correlations both at the genotypic and phenotypic levels, demonstrating the possibility of simultaneous improvement of the traits. Path coefficient analysis revealed that acidity, flavor, and body had a high positive direct effect on overall cup quality, implying that these traits can be used as indirect criteria to improve overall coffee quality. Therefore, it was concluded that there is considerable variation among the accessions, which need to be properly conserved for future improvement of the coffee quality. However, the variability observed for quality attributes must be further verified using biochemical and molecular analysis.

Keywords : accessions, Coffea arabica, cluster analysis, correlation, principal component
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