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# Evaluation of Arabica Coffee (*Coffea arabica* L.) Genotypes for Biometrical Traits

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**An experiment on arabica coffee (*Coffea arabica* L.) genotypes for biometrical traits evaluation was carried out at Chettalli in Karnataka during the period 2004 - 2007 to study the variation in the vegetative and yield component traits. Eighty five genotypes exhibited significant variation for all the traits in three seasons of the study. The *per se* performance of present study revealed that the traits viz., plant height, bush diameter, stem girth, number of primary branches, length of primary branches, internodal length, leaf area, number of flowers per axil, number of flowers per node, fruit length, fruit width, number of fruits per node, fruit set percentage, weight of fruits per plant and percentage of fruit fertility were high in Tafarikela, Maragogipe, Cauvery x Sln.9 and S.12, Kaffa. For the trait viz., percentage of A grade beans and weight of 100 A grade beans, the genotypes Cioccie, Agaro, Maragogipe and Taferikela recorded the highest *per se* values. Mean percentage of caffeine content was higher in the genotype Kents, closely followed by Agaro, Maragogipe, Tafarikela and Cauvery x Sln. 9. Hence the genotypes can be exploited in selection for further breeding programmes for the respective traits. The genotypes Taferikela, Maragogipe, Cauvery x Sln.9, S12, Kaffa and Agaro recorded higher fruit length and fruit width. Mean performance of clean coffee per hectare showed that the genotype Tafarikela registered the highest value followed by Maragogipe, Cauvery x Sln.9, S12, Kaffa and Agaro.**

**Key words:** Genotypes, biometrical traits, *per se* performance, caffeine, grade, clean coffee

Coffee is an important beverage crop used all over the world. It is native of Ethiopia and occupies a place of pride in international trade next to petroleum. Major coffee producing countries are Brazil, Cameroon, Congo, Costa Rica. Ethiopia, Guatemala, Guinea, Kenya, Puerto Rico and Sudan. India has emerged as a quality coffee producer with a total production of 288000 MT from 328157 hectares during 2006-07 accounting for a world share of 4.45 per cent. In India, it is mainly cultivated in Karnataka, Kerala, Tamil Nadu, Andhra Pradesh and North East regions. The stimulative effect of coffee is due to the presence of caffeine content. Coffee consumption has been associated with reduced risk of several diseases including certain cancers, Parkinson's disease, hepatic diseases, kidney stones and also for increased mental alertness, reduction of fatigue and improvement in the performance on vigilance tasks.

However in the export trade, India does not hold any key place in realization of its potential which necessitates improvement in yield and quality. In view of breeding constraints and complexities, the identification of potential genotypes has been considered very important. In genus coffea, only two species *Coffea arabica* L. and *C. canephora* are commercially cultivated in India. *C. arabica* is self compatible tetraploid while *C. canephora* is self-incompatible diploid species (Srinivasan *et al*, 1979). In order to increase the yield, productivity and quality components of this crop, crop improvement research becomes inevitable. Selection of promising types from the gene pool is the most useful method of crop improvement in this crop.

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The primary objective of any crop improvement programme is identification of promising genotypes for which knowledge on variability existing in a population is imperative. Studies on variability helps in locating the desirable plant type either for direct introduction or to use in the further breeding programme. The yield being a complex character, knowledge on the optimal plant characters, the extent of variability available and character association with yield, is essential to improve the yield level in coffee. The genetic variability and association of different characters help us to develop our effective selection of suitable parents in breeding. Hence identification of coffee genotype that exhibits a consistently higher rate of transmission of their desirable characters to the progeny would be highly useful for improvement of yield.

## Materials and Methods

The experiment was conducted at Coffee Board, Coffee Research Sub Station, Chettalli, North Coorg

Dist, Karnataka which is situated at 12ºN latitude 75ºE longitude and at an elevation of 1038 m above mean sea level. The study was carried out during three seasons viz., season I (2004 –2005), season II (2005- 2006) and season III (2006 –2007). Eighty five genotypes maintained in the arabica coffee germplasm collection at Coffee Board, Coffee Research Sub Station, Chettalli, Coorg dist, Karnataka, were selected for this study. The details of the genotypes are presented in Table 1.

The experimental plot size was 30 m x 4 m with spacing of 2m x 2m accommodating 30 plants per plot. All the genotypes taken for study were collected from different countries. The plants were allowed to grow on topped single stem system under a mixed shade canopy and all plants were sprayed with Bordeaux mixture twice in a year and standard cultural practices were adopted. Uniform fertilizer application at the rate of 40:30:40 NPK kg/ha twice a year (pre monsoon and post monsoon) was given to all the plots. The experiment was laid out in a randomized block design with three replications. Five randomly selected plants in each genotype per replication were tagged for recording observations on plant characters and the mean values were subjected to statistical scrutiny. The selection of plants within genotypes and within field was done with care to see that there was no field and plot variation. Recommended package of practices were followed for all the genotypes (Anonymous, 2003). The observations recorded on eighty five coffee (*Coffea arabica* L.) genotypes for twenty characters *viz*., plant height, bush diameter, stem girth, number of primary branches, length of primary branches, internodal length, leaf area, number of flowers per axil, number of flowers per node, fruit length, fruit girth, number of fruits per node, fruit setting per cent, weight of fruits per plant, yield of clean coffee per hectare, percentage of fruit fertility (100 well developed fruits in hard endosperm stage were transversely cut and the fruit fertility was recorded), percentage of ‘A’ grade beans, weight of 100 A grade beans, caffeine content and per cent rust incidence were recorded.

## Results and Discussion

The data on mean performance, range and variability of genotypes were observed for twenty characters for three seasons (2004-2005, 2005-2006 and 2006- 2007).

Among the eighty five genotypes studied, the difference in morphological traits were noticeable among arabica coffee varieties. In all the three seasons, a wide range of variation was exhibited for plant height, bush diameter and stem girth in the Taferikela, Maragogipe, Cauvery x Sln.9 and S.12 Kaffa genotypes (Table 2). The increase in the plant height and yield of clean coffee across the genotypes were relatively uniform. The variation among the genotypes of coffee for the morphological attributes

**Table 1. Genotypes and source of genotypes of arabica coffee**

| S.No. | Genotype | Name | Source |
|---|---|---|---|
| 1 | S.1495 | Tafarikela | Ethiopia |
| 2 | S.881 | Rume Sudan | Sudan, Kenya |
| 3 | S.1593 | Jimma Galla Sidamo | Kenya |
| 4 | S.1779 | Limma Gimma Kaffa | Ethiopia |
| 5 | S.1784 | Misan Tafarikela | Ethiopia |
| 6 | S.1783 | Babaca Kaffa | Ethiopia |
| 7 | S.1497 | S. 12 Kaffa | Ethiopia |
| 8 | S.1785 | Ainamba Kaffa | Ethiopia |
| 9 | S.1782 | Badabuna Jimma Kaffa | Ethiopia |
| 10 | S.882 | Barbuk Sudan | Sudan |
| 11 | S.1700 | COF297 Zambeia Mocambic | Portugal |
| 12 | S.1591 | Dalle Melville | Kenya |
| 13 | S.1590 | Dalle Mixed | Kenya |
| 14 | S.1580 | Dele CHO | Kenya |
| 15 | S.1582 | S-16 Wollamo | Portugal |
| 16 | S.1581 | 2 B Enneria | Portugal |
| 17 | S.1583 | S-17 Yrgalem | Portugal |
| 18 | S.2130 | Dilla and Alghe | Kenya |
| 19 | S.2129 | (110/2) S 4 Agaro | Portugal |
| 20 | S.2128 | (110/5) Agaro | Portugal |
| 21 | S.2126 | (113/1)S/6 Cioccie | Portugal |
| 22 | S.2127 | (113/2)S/6 Cioccie | Portugal |
| 23 | S.1659 | Kouti | Paris |
| 24 | S.1699 | Mbirizi de Mulungu | Portugal |
| 25 | S.1698 | Local Bronze De Mulungu | Congo |
| 26 | S.1664 | Nicaragua | Paris |
| 27 | S.1726 | Cundina Marca | Surinam |
| 28 | S.1661 | Mkoungan | Paris |
| 29 | S.1663 | Reunion | Paris |
| 30 | S.1656 | Salvador | Guinea |
| 31 | S.1466 | Leroy Laurina | Gautemala |
| 32 | S.1742 | Maragogipe | Tanganyika |
| 33 | S.1493 | Laurina Maragogipe | USDA |
| 34 | S.1476 | Kona | Gautemala |
| 35 | S.1768 | Murta | Gautemala |
| 36 | S.1417 | San Ramon | Guatemala |
| 37 | S.1497 | S12 Kaffa | Ethiopia |
| 38 | S.1743 | Giesha | Tanganyika |
| 39 | S.1470 | Blue Mountain | Gautemala |
| 40 | S.1467 | Sumatra | Gautemala |
| 41 | S.1472 | Phillipinean | Gautemala |
| 42 | S.1648 | Costa Rica | Guinea |
| 43 | S.1694 | Puerto Rico | Congo |
| 44 | S.1471 | Padang | Gautemala |
| 45 | S.1468 | Surinam | Gautemala |
| 46 | S.1494 | Mundo Novo | USDA |
| 47 | S.1463 | Typica | Gautemala |
| 48 | S.1464 | Bourbon | Gautemala |
| 49 | S.1490 | Bourbon Amarelo | USDA |
| 50 | S.1491 | Bourbon Vermelho | USDA |
| 51 | S.1492 | Caturra Amarelo | USDA |
| 52 | S.1504 | Mysore | Congo |
| 53 | S.1483 | K.P. 423 ( Kents ) | Tanganyika |
| 54 | S.1586 | K - 7 | Kenya |
| 55 | S.1905 | S.L. 34 | Burma |
| 56 | S.1660 | Kenya | Paris |
| 57 | S.1693 | C. Arabica578 | Paris |
| 58 | S.1735 | Darnimin | Srilanka |
| 59 | S.1465 | Pache | Gautemala |
| 60 | S.1696 | Granja Bloomay | Congo |
| 61 | S.1655 | Mokablac | Guinea |
| 62 | S.1695 | Antigua | Congo |

**Table 1. continued . . .**

| S.No. | Genotype | Name | Source |
|---|---|---|---|
| 63 | S.1692 | Barbirina | Congo |
| 64 | S.1734 | Martinique | Surmarno |
| 65 | S.1652 | Macenta | Guinea |
| 66 | S.1697 | Tumbadir | Congo |
| 67 | S.1662 | Foumbon | Paris |
| 68 | S.1667 | Mazeron | Paris |
| 69 | S.1691 | Las Palmas | Congo |
| 70 | S.1690 | Green Tipped | Congo |
| 71 | S.1591 | Delle Melville | Kenya |
| 72 | S.1653 | Togo Kouma | Guinea |
| 73 | S.1473 | Goudaluope | Gautemala |
| 74 | S.1737 | Madagaskar | Portugal |
| 75 | S.1502 | Bourbon Mayagese | Congo |
| 76 | S.1726 | Cundina Marca | Surinam |
| 77 | S.2790 | Sln.9 | India |
| 78 | S.4349 | Cauvery | India |
| 79 | S.4850 | Sln.9 X Cauvery | India |
| 80 | S.4843 | Cauvery X Sln.9 | India |
| 81 | S.4854 | S.881 X Cauvery | India |
| 82 | S.4844 | Cauvery X S.881 | India |
| 83 | S.4846 | Taferikela X Cauvery | India |
| 84 | S.4855 | Cauvery X Taferikela | India |
| 85 | S.4847 | Cauvery X Cauvery | India |

may be due to their diversified origin and acclimatization of the particular genotype as morphotype in their specific geographical locations. Similar kind of report on evaluation of genotypes for growth and yield of clean coffee was made by Srinivasan and Subbalakshmi (1981). It clearly depicts that the expression of enhanced plant height among genotypes may be attributed to the differential ability of genotypes for the synthesis of phytohormones and nutritional factors, involved in the growth mechanism as reported by Santaram *et al* (1986), Ahmed and Sreenivasan (1988) and Ram *et al.* (1994) in coffee.

Taferikela, Maragogipe, Cauvery x Sln.9 and S.12 Kaffa were better performers in their growth characters viz., plant height, bush diameter and stem girth which indicated that these genotypes showed higher vegetative vigour which might be attributed due to better adaptability of the genotypes under Chettalli, Coorg dist, Karnataka condition than other genotypes. The best performance of the genotypes may be due to higher efficiency of genes in combination with environment made higher synthesis of carbohydrates due to increased photosynthetic efficiency would have resulted in better partitioning in reserved food. The results are in concordance with the earlier work of Sreenivasan

**Table 2. Mean performance of arabica coffee genotypes for morphological characters (mean of three seasons)**

| S.No. | Genotype | Plant height (cm) | Bush diameter (cm) | Stem girth (cm) | No.of primary branches | Length of primary branches (cm) | Internodal length (cm) |
|---|---|---|---|---|---|---|---|
| 1. | S.1495 | 172.14 | 186.01 | 30.29 | 9.40 | 115.20 | 10.25 |
| 2. | S.881 | 123.95 | 123.89 | 26.67 | 6.22 | 91.70 | 8.95 |
| 3. | S.1593 | 93.88 | 119.20 | 21.91 | 4.68 | 77.94 | 6.25 |
| 4. | S.1779 | 80.50 | 122.31 | 26.07 | 4.15 | 71.38 | 6.52 |
| 5. | S.1784 | 104.71 | 139.59 | 27.57 | 4.68 | 79.94 | 7.93 |
| 6. | S.1783 | 104.01 | 138.74 | 26.07 | 3.78 | 82.44 | 8.18 |
| 7. | S.1497 | 143.91 | 175.74 | 28.61 | 7.44 | 105.98 | 10.49 |
| 8. | S.1785 | 93.36 | 138.66 | 27.30 | 4.35 | 93.39 | 7.60 |
| 9. | S.1782 | 80.47 | 144.67 | 27.21 | 4.08 | 82.09 | 8.96 |
| 10. | S.882 | 88.36 | 129.26 | 25.78 | 3.68 | 67.09 | 9.23 |
| 11. | S.1700 | 85.88 | 121.96 | 26.61 | 4.68 | 83.61 | 8.60 |
| 12. | S.1591 | 85.12 | 117.23 | 26.52 | 3.81 | 72.88 | 7.73 |
| 13. | S.1590 | 77.06 | 112.27 | 26.38 | 4.15 | 75.53 | 8.17 |
| 14. | S.1580 | 83.14 | 134.31 | 26.59 | 3.88 | 88.04 | 7.10 |
| 15. | S.1582 | 86.74 | 135.92 | 26.43 | 3.95 | 85.38 | 6.78 |
| 16. | S.1581 | 96.22 | 116.26 | 25.79 | 3.75 | 77.19 | 7.16 |
| 17. | S.1583 | 88.86 | 130.43 | 25.98 | 3.61 | 80.27 | 7.77 |
| 18. | S.2130 | 98.66 | 119.27 | 25.61 | 4.38 | 76.08 | 7.65 |
| 19. | S.2129 | 91.15 | 127.36 | 28.42 | 5.35 | 72.76 | 8.26 |
| 20. | S.2128 | 138.96 | 172.29 | 28.35 | 7.32 | 102.01 | 9.36 |
| 21. | S.2126 | 116.78 | 157.35 | 26.26 | 5.32 | 83.19 | 9.03 |
| 22. | S.2127 | 91.67 | 132.36 | 25.86 | 5.82 | 85.72 | 8.43 |
| 23. | S.1659 | 93.68 | 106.32 | 25.25 | 4.23 | 71.24 | 7.67 |
| 24. | S.1699 | 81.94 | 118.93 | 25.60 | 4.25 | 71.33 | 7.25 |
| 25. | S.1698 | 93.30 | 117.79 | 25.61 | 4.01 | 78.92 | 7.08 |
| 26. | S.1664 | 97.86 | 109.03 | 25.95 | 4.81 | 76.96 | 7.11 |
| 27. | S.1726 | 82.81 | 123.75 | 26.21 | 4.68 | 77.82 | 7.33 |
| 28. | S.1661 | 82.38 | 123.94 | 25.83 | 4.48 | 76.36 | 7.74 |
| 29. | S.1663 | 96.99 | 129.13 | 27.06 | 4.08 | 68.32 | 7.71 |
| 30. | S.1656 | 88.63 | 96.52 | 25.52 | 3.95 | 74.27 | 7.98 |

**Table 2. continued . . .**

| S.No. | Genotype | Plant height (cm) | Bush diameter (cm) | Stem girth (cm) | No.of primary branches | Length of primary branches (cm) | Internodal length (cm) |
|---|---|---|---|---|---|---|---|
| 31. | S.1466 | 69.99 | 82.49 | 26.12 | 3.21 | 48.78 | 4.46 |
| 32. | S.1742 | 156.02 | 188.99 | 29.41 | 8.20 | 123.94 | 10.89 |
| 33. | S.1493 | 106.18 | 106. 59 | 27.16 | 3.71 | 73.55 | 9.21 |
| 34. | S.1476 | 65.70 | 115.78 | 23.37 | 2.41 | 80.37 | 4.13 |
| 35. | S.1768 | 67.56 | 76.87 | 22.79 | 2.60 | 44.22 | 3.48 |
| 36. | S.1470 | 85.95 | 74.05 | 21.18 | 4.81 | 40.17 | 3.04 |
| 37. | S.1497 | 88.11 | 97.52 | 24.25 | 3.81 | 67.03 | 7.95 |
| 38. | S.1743 | 115.44 | 153.19 | 26.45 | 6.09 | 88.56 | 9.05 |
| 39. | S.1470 | 98.53 | 132.50 | 27.05 | 4.55 | 72.48 | 7.12 |
| 40. | S.1467 | 97.56 | 109.30 | 25.51 | 4.01 | 76.27 | 5.78 |
| 41. | S.1472 | 109.00 | 136.26 | 25.23 | 4.31 | 76.80 | 8.24 |
| 42. | S.1648 | 83.27 | 106.02 | 27.13 | 5.18 | 75.86 | 7.19 |
| 43. | S.1694 | 67.73 | 78.59 | 23.67 | 3.14 | 47.95 | 4.13 |
| 44. | S.1471 | 77.52 | 108.83 | 25.75 | 4.95 | 68.44 | 8.36 |
| 45. | S.1468 | 92.91 | 104.51 | 25.42 | 4.08 | 78.57 | 7.72 |
| 46. | S.1494 | 107.33 | 106.56 | 24.79 | 4.55 | 78.06 | 7.30 |
| 47. | S.1463 | 79.23 | 114.78 | 25.58 | 3.95 | 71.39 | 7.19 |
| 48. | S.1464 | 83.77 | 126.22 | 25.13 | 5.19 | 71.03 | 7.81 |
| 49. | S.1490 | 93.35 | 119.53 | 25.20 | 5.05 | 74.89 | 7.29 |
| 50. | S.1491 | 97.72 | 111.13 | 24.82 | 5.42 | 59.64 | 8.13 |
| 51. | S.1492 | 93.39 | 100.63 | 25.19 | 4.88 | 78.44 | 6.79 |
| 52. | S.1504 | 99.66 | 113.84 | 25.21 | 5.32 | 71.64 | 6.34 |
| 53. | S.1483 | 134.06 | 162.03 | 28.41 | 7.17 | 100.28 | 9.85 |
| 54. | S.1586 | 90.97 | 105.49 | 25.57 | 4.68 | 88.21 | 7.36 |
| 55. | S.1905 | 87.75 | 116.39 | 25.65 | 3.81 | 65.22 | 7.23 |
| 56. | S.1660 | 96.38 | 128.43 | 25.55 | 5.35 | 79.60 | 7.61 |
| 57. | S.1693 | 84.10 | 108.73 | 26.64 | 5.12 | 81.78 | 7.35 |
| 58. | S.1735 | 106.11 | 113.95 | 27.47 | 4.65 | 81.81 | 7.33 |
| 59. | S.1465 | 72.88 | 86.13 | 23.72 | 3.31 | 49.03 | 5.41 |
| 60. | S.1696 | 104.78 | 112.15 | 25.14 | 5.08 | 83.84 | 8.12 |
| 61. | S.1655 | 93.33 | 100.33 | 25.16 | 4.51 | 76.39 | 7.17 |
| 62. | S.1695 | 103.90 | 130.43 | 26.79 | 4.51 | 80.41 | 8.28 |
| 63. | S.1692 | 91.74 | 110.19 | 25.71 | 4.08 | 69.80 | 8.17 |
| 64. | S.1734 | 99.99 | 126.15 | 24.93 | 4.68 | 83.01 | 7.04 |
| 65. | S.1652 | 94.43 | 123.48 | 26.00 | 5.16 | 73.50 | 6.80 |
| 66. | S.1697 | 97.11 | 115.38 | 25.21 | 4.18 | 75.95 | 7.59 |
| 67. | S.1662 | 93.31 | 121.00 | 25.39 | 4.95 | 85.62 | 6.86 |
| 68. | S.1667 | 83.11 | 129.00 | 26.19 | 5.15 | 76.15 | 7.16 |
| 69. | S.1691 | 94.86 | 118.23 | 25.82 | 3.68 | 70.63 | 7.09 |
| 70. | S.1690 | 85.15 | 110.30 | 24.88 | 5.69 | 82.37 | 7.29 |
| 71. | S.1591 | 103.29 | 106.59 | 25.09 | 4.82 | 68.09 | 7.36 |
| 72. | S.1653 | 100.20 | 128.39 | 24.63 | 5.25 | 77.75 | 7.32 |
| 73. | S.1473 | 100.21 | 100.94 | 25.75 | 4.31 | 86.59 | 7.06 |
| 74. | S.1737 | 93.32 | 123.54 | 26.60 | 4.35 | 80.60 | 7.11 |
| 75. | S.1502 | 91.57 | 115.07 | 25.76 | 4.75 | 81.74 | 6.79 |
| 76. | S.1726 | 86.82 | 121.47 | 25.36 | 4.01 | 80.80 | 7.41 |
| 77. | S.2790 | 125.55 | 143.14 | 27.02 | 6.02 | 87.36 | 6.52 |
| 78. | S.4349 | 99.35 | 109.23 | 25.01 | 6.57 | 72.34 | 8.63 |
| 79. | S.4850 | 110.65 | 155.36 | 27.36 | 6.52 | 75.54 | 6.80 |
| 80. | S.4843 | 149.73 | 181.33 | 28.74 | 7.61 | 137.14 | 9.98 |
| 81. | S.4854 | 127.90 | 131.34 | 25.29 | 5.99 | 77.22 | 8.40 |
| 82. | S.4844 | 111.01 | 162.11 | 27.86 | 5.91 | 93.78 | 10.37 |
| 83. | S.4846 | 120.27 | 102.64 | 25.35 | 4.92 | 81.41 | 8.09 |
| 84. | S.4855 | 125.55 | 141.87 | 27.43 | 6.02 | 104.99 | 9.33 |
| 85. | S.4847 | 100.67 | 116.27 | 25.05 | 6.02 | 90.27 | 6.78 |
| GM | | 98.1070 | 122.8442 | 25.9565 | 4.8382 | 78.9681 | 7.5819 |
| SEd | | 8.2467 | 10.3763 | 1.1545 | 0.6686 | 7.3130 | 0.7326 |
| CD (.05) | | 16.2810 | 20.4853 | 2.2792 | 1.3199 | 14.4377 | 1.4463 |

*et al,* (1993), Sadananda and Azizuddin (1996) and Arunkumar (2003) in turmeric.

The number of primary branches per plant was statistically significant among the genotypes of arabica coffee (Table 2). The findings of the present study revealed that the genotypes Tafarikala, Margogipe and Cauvery × Sln.9 were superior in their performance to number of primary branches per plant which might be due to the vigour of the concerned genotypes. This indicates the suitability of these genotypes to Karnataka conditions than other genotypes. This is in consonance with the earlier work of Ram *et al*. (1992) in coffee.

**Table 3. Mean performance of arabica coffee genotypes for leaf area and yield characters (mean of three seasons)**

| S.No. | Genotype | Leaf area ($cm_3$) | Number of flowers per axil | Fruit length (mm) | Fruit width (mm) | Fruit set percentage | No.of fruits per node |
|---|---|---|---|---|---|---|---|
| 1. | S.1495 | 101.18 | 10.90 | 23.93 | 17.78 | 88.30 | 23.48 |
| 2. | S.881 | 72.95 | 9.16 | 17.17 | 11.73 | 73.94 | 16.26 |
| 3. | S.1593 | 49.51 | 7.03 | 14.99 | 4.03 | 28.26 | 5.04 |
| 4. | S.1779 | 66.29 | 7.93 | 15.79 | 12.71 | 53.73 | 4.47 |
| 5. | S.1784 | 54.62 | 7.63 | 15.58 | 12.66 | 60.47 | 8.80 |
| 6. | S.1783 | 53.13 | 6.21 | 15.69 | 13.06 | 52.71 | 6.59 |
| 7. | S.1497 | 93.72 | 10.03 | 18.53 | 15.87 | 80.03 | 17.05 |
| 8. | S.1785 | 43.44 | 5.96 | 16.05 | 12.81 | 37.59 | 6.72 |
| 9. | S.1782 | 47.40 | 7.83 | 15.88 | 12.71 | 40.29 | 5.64 |
| 10. | S.882 | 49.29 | 5.69 | 15.76 | 13.36 | 72.58 | 6.60 |
| 11. | S.1700 | 43.50 | 6.93 | 16.06 | 12.91 | 47.99 | 5.78 |
| 12. | S.1591 | 52.93 | 5.69 | 16.08 | 13.02 | 52.17 | 5.41 |
| 13. | S.1590 | 46.43 | 6.69 | 16.18 | 14.21 | 37.47 | 7.20 |
| 14. | S.1580 | 42.39 | 7.02 | 16.56 | 13.46 | 46.83 | 7.63 |
| 15. | S.1582 | 42.17 | 7.36 | 16.79 | 13.20 | 34.11 | 5.20 |
| 16. | S.1581 | 45.08 | 6.69 | 16.52 | 12.86 | 68.63 | 5.85 |
| 17. | S.1583 | 43.31 | 7.86 | 16.14 | 13.10 | 60.09 | 6.04 |
| 18. | S.2130 | 45.75 | 6.68 | 15.54 | 12.55 | 28.38 | 5.57 |
| 19. | S.2129 | 51.18 | 6.52 | 15.58 | 12.00 | 62.40 | 8.53 |
| 20. | S.2128 | 88.42 | 10.03 | 18.00 | 15.12 | 80.01 | 16.55 |
| 21. | S.2126 | 66.12 | 8.36 | 16.40 | 13.76 | 65.25 | 15.75 |
| 22. | S.2127 | 63.58 | 8.47 | 16.50 | 13.10 | 69.57 | 6.95 |
| 23. | S.1659 | 48.38 | 7.69 | 16.76 | 14.06 | 24.10 | 4.69 |
| 24. | S.1699 | 48.19 | 7.36 | 16.71 | 13.59 | 38.80 | 7.48 |
| 25. | S.1698 | 43.25 | 5.69 | 15.91 | 13.56 | 39.72 | 6.31 |
| 26. | S.1664 | 52.39 | 7.03 | 16.54 | 14.32 | 35.66 | 4.48 |
| 27. | S.1726 | 50.17 | 7.86 | 16.95 | 12.70 | 37.47 | 5.77 |
| 28. | S.1661 | 44.77 | 7.03 | 14.68 | 11.39 | 46.48 | 7.05 |
| 29. | S.1663 | 42.23 | 6.02 | 14.82 | 13.01 | 23.76 | 5.63 |
| 30. | S.1656 | 46.85 | 7.03 | 15.10 | 14.46 | 27.42 | 4.32 |
| 31. | S.1466 | 36.82 | 4.64 | 13.14 | 10.64 | 19.07 | 3.87 |
| 32. | S.1742 | 101.18 | 10.54 | 20.06 | 17.01 | 84.72 | 17.65 |
| 33. | S.1493 | 55.01 | 6.22 | 14.65 | 14.46 | 55.09 | 4.29 |
| 34. | S.1476 | 30.38 | 3.01 | 10.88 | 9.70 | 16.24 | 3.50 |
| 35. | S.1768 | 32.83 | 4.85 | 11.76 | 10.03 | 17.61 | 3.75 |
| 36. | S.1470 | 51.15 | 8.70 | 15.51 | 13.66 | 49.17 | 12.66 |
| 37. | S.1497 | 56.08 | 8.19 | 17.06 | 11.73 | 63.40 | 10.12 |
| 38. | S.1743 | 80.29 | 7.86 | 16.91 | 14.36 | 70.85 | 11.34 |
| 39. | S.1470 | 52.40 | 6.35 | 16.09 | 12.78 | 62.31 | 6.33 |
| 40. | S.1467 | 50.98 | 6.36 | 16.09 | 13.59 | 26.76 | 5.97 |
| 41. | S.1472 | 62.42 | 5.68 | 16.50 | 12.78 | 26.65 | 6.38 |
| 42. | S.1648 | 60.92 | 6.36 | 16.90 | 11.73 | 43.13 | 5.93 |
| 43. | S.1694 | 34.11 | 4.46 | 12.63 | 11.86 | 18.35 | 4.06 |
| 44. | S.1471 | 64.99 | 7.83 | 16.14 | 12.11 | 51.50 | 15.22 |
| 45. | S.1468 | 56.99 | 6.68 | 15.99 | 12.77 | 62.51 | 4.91 |
| 46. | S.1494 | 57.64 | 7.83 | 609.48 | 12.65 | 25.58 | 5.50 |
| 47. | S.1463 | 57.92 | 5.95 | 16.14 | 12.20 | 38.29 | 5.66 |
| 48. | S.1464 | 50.15 | 5.41 | 16.14 | 13.43 | 46.14 | 6.21 |
| 49. | S.1490 | 61.05 | 6.56 | 16.79 | 12.14 | 48.72 | 6.83 |
| 50. | S.1491 | 50.43 | 7.69 | 16.74 | 12.14 | 26.29 | 6.77 |

**Table 3. continued . . .**

| S.No. | Genotype | Leaf area (cm3) | Number of flowers per axil | Fruit length (mm) | Fruit width (mm) | Fruit set percentage | No.of fruits per node |
|---|---|---|---|---|---|---|---|
| 51. | S.1492 | 64.68 | 6.68 | 16.18 | 12.82 | 36.79 | 6.48 |
| 52. | S.1504 | 56.72 | 7.36 | 16.28 | 14.01 | 29.32 | 6.63 |
| 53. | S.1483 | 85.23 | 8.86 | 17.84 | 13.72 | 80.92 | 16.25 |
| 54. | S.1586 | 52.62 | 8.70 | 16.72 | 12.59 | 44.89 | 5.91 |
| 55. | S.1905 | 54.52 | 7.86 | 16.66 | 13.76 | 41.55 | 5.45 |
| 56. | S.1660 | 60.43 | 8.03 | 16.61 | 12.54 | 59.78 | 4.85 |
| 57. | S.1693 | 49.33 | 5.81 | 16.84 | 13.17 | 38.79 | 4.59 |
| 58. | S.1735 | 68.81 | 6.88 | 16.92 | 12.77 | 23.76 | 7.75 |
| 59. | S.1465 | 37.95 | 4.86 | 13.54 | 10.92 | 19.39 | 4.50 |
| 60. | S.1696 | 57.92 | 7.45 | 16.74 | 12.20 | 23.50 | 6.38 |
| 61. | S.1655 | 58.84 | 7.46 | 16.50 | 12.33 | 42.94 | 4.79 |
| 62. | S.1695 | 57.81 | 7.63 | 16.22 | 12.02 | 51.94 | 5.02 |
| 63. | S.1692 | 52.52 | 7.55 | 16.12 | 12.38 | 30.24 | 5.32 |
| 64. | S.1734 | 51.85 | 6.76 | 16.79 | 13.93 | 34.75 | 6.38 |
| 65. | S.1652 | 50.49 | 7.44 | 16.41 | 12.64 | 30.16 | 7.02 |
| 66. | S.1697 | 58.48 | 6.89 | 16.35 | 12.58 | 29.21 | 5.20 |
| 67. | S.1662 | 56.60 | 6.88 | 15.79 | 11.96 | 44.21 | 4.61 |
| 68. | S.1667 | 52.58 | 8.63 | 15.89 | 11.84 | 49.13 | 5.83 |
| 69. | S.1691 | 58.62 | 8.33 | 16.28 | 12.57 | 36.32 | 5.70 |
| 70. | S.1690 | 58.75 | 8.16 | 16.06 | 12.11 | 25.09 | 6.90 |
| 71. | S.1591 | 60.47 | 7.42 | 16.16 | 12.51 | 27.30 | 7.85 |
| 72. | S.1653 | 66.98 | 7.09 | 15.66 | 12.58 | 45.26 | 6.83 |
| 73. | S.1473 | 61.80 | 6.55 | 16.72 | 12.82 | 48.21 | 5.56 |
| 74. | S.1737 | 63.48 | 7.09 | 15.69 | 12.18 | 64.69 | 6.19 |
| 75. | S.1502 | 53.35 | 8.16 | 16.12 | 12.11 | 58.87 | 6.52 |
| 76. | S.1726 | 50.68 | 7.90 | 16.51 | 12.56 | 43.09 | 7.72 |
| 77. | S.2790 | 52.23 | 6.02 | 15.06 | 13.90 | 71.24 | 14.05 |
| 78. | S.4349 | 59.61 | 5.86 | 16.44 | 12.20 | 72.33 | 15.05 |
| 79. | S.4850 | 64.45 | 6.42 | 16.52 | 11.96 | 71.56 | 12.98 |
| 80. | S.4843 | 94.13 | 10.06 | 18.94 | 16.26 | 81.68 | 17.49 |
| 81. | S.4854 | 60.30 | 8.56 | 15.67 | 12.74 | 75.59 | 10.89 |
| 82. | S.4844 | 100.82 | 8.46 | 16.55 | 13.55 | 69.56 | 10.61 |
| 83. | S.4846 | 60.75 | 8.03 | 15.89 | 12.70 | 69.56 | 7.62 |
| 84. | S.4855 | 71.28 | 8.03 | 17.59 | 14.99 | 76.59 | 15.36 |
| 85. | S.4847 | 60.18 | 9.16 | 15.43 | 13.58 | 64.22 | 8.16 |
| GM | | 57.3218 | 7.2537 | 23.1820 | 12.8744 | 47.9885 | 7.8612 |
| SEd | | 8.3806 | 0.7868 | NS | 0.8777 | 6.5802 | 1.2761 |
| CD (.05) | | 16.5453 | 1.5533 | NS | 1.7328 | 12.9910 | 2.5192 |

Regarding the length of primary branches, the eighty five genotypes showed noticeable variations among themselves. The longest primary branch was recorded in Cauvery x Sln.9 (137.14 cm), followed by Tafarikala, Maragogipe in the present study. The length of primary branches decides the number of secondary and tertiary branches. Higher number of branches observed with respective genotypes would have resulted in high vegetative vigour and ultimately resulted in higher yield as reported by Srinivasan (1988), Selvakumar *et al.* (1992) Sadananda and Azizudin (1996), Nair and Nampoothiri (1993) and Ratnambal *et al*. (1995). The genotype San Ramon exhibited shorter length of primary branches (40.17 cm) followed by Murta, Puerto Rico and Leroy Laurina. Ram *et al.* (1992) also reported variations for this character among different arabica coffee populations.

Among the different arabica genotypes studied, the character internodal length showed notably high variation. The longest internode was recorded in Maragogipe (10.89) where as the genotype San Ramon exhibited the shortest internodal length (Table 2). Shorter internodal length gives more number of nodes per branch which facilitates higher yield in coffee. Narasimhaswamy (1965), Ahmed and Srinivasan (1988) and Kumar *et al*. (1999) also reported variations for this character among different coffee populations.

Mean leaf area, showed significant difference among the coffee genotypes studied. The leaf area is an important character, since it decides the ability of the leaf to support the yield of fruit and also the photosynthetic efficiency as reported by Srinivasan (1972), Orozco and Nieto (1972) and Selvakumar *et al.* (1992), Choudhuri and Hore (2004). The mean

**Table 4. Mean performance of arabica coffee genotypes for yield characters, quality characters and percentage of rust disease incidence (mean of three seasons)**

| S.No. | Genotype | Weight of fruits per plant (kg) | Yield of clean coffee (kg ha-1) | Percentage of fruit fertility | Percentage of 'A' grade beans | Weight of 100 'A' grade beans (g) | Caffeine content (%) | % of rust disease incidence |
|---|---|---|---|---|---|---|---|---|
| 1. | S.1495 | 7.01 | 2827.79 | 97.78 | 76.51 | 18.86 | 2.80 | 12.17 |
| 2. | S.881 | 3.59 | 1975.55 | 88.93 | 73.07 | 15.64 | 1.98 | 17.59 |
| 3. | S.1593 | 1.30 | 809.33 | 68.55 | 58.19 | 16.14 | 0.76 | 29.26 |
| 4. | S.1779 | 1.72 | 889.67 | 77.24 | 60.20 | 14.79 | 0.71 | 17.49 |
| 5. | S.1784 | 1.49 | 752.89 | 78.60 | 65.79 | 14.14 | 0.34 | 25.55 |
| 6. | S.1783 | 3.01 | 1471.55 | 74.48 | 67.23 | 14.90 | 1.74 | 36.91 |
| 7. | S.1497 | 4.97 | 2244.78 | 95.68 | 75.87 | 19.02 | 2.68 | 16.06 |
| 8. | S.1785 | 1.47 | 634.78 | 77.25 | 59.67 | 15.11 | 1.60 | 29.26 |
| 9. | S.1782 | 1.80 | 896.33 | 70.90 | 54.86 | 13.93 | 1.29 | 26.01 |
| 10. | S.882 | 3.68 | 1762.56 | 75.91 | 59.77 | 15.28 | 0.95 | 28.14 |
| 11. | S.1700 | 2.51 | 1913.11 | 73.58 | 55.20 | 16.38 | 0.67 | 30.76 |
| 12. | S.1591 | 2.78 | 1591.89 | 73.78 | 62.22 | 14.79 | 0.53 | 30.20 |
| 13. | S.1590 | 2.58 | 1156.56 | 78.60 | 48.47 | 14.39 | 0.57 | 28.09 |
| 14. | S.1580 | 3.34 | 1471.56 | 73.12 | 46.60 | 14.31 | 0.75 | 26.37 |
| 15. | S.1582 | 2.22 | 1040.11 | 81.49 | 52.71 | 14.89 | 1.20 | 28.42 |
| 16. | S.1581 | 2.53 | 1150.44 | 73.69 | 51.76 | 16.34 | 0.93 | 31.77 |
| 17. | S.1583 | 1.79 | 893.00 | 79.90 | 45.01 | 13.82 | 0.87 | 51.12 |
| 18. | S.2130 | 1.38 | 759.11 | 70.90 | 43.27 | 14.36 | 0.92 | 38.38 |
| 19. | S.2129 | 3.35 | 1636.66 | 92.63 | 57.03 | 17.81 | 2.57 | 15.67 |
| 20. | S.2128 | 4.68 | 2182.56 | 94.93 | 78.50 | 19.69 | 2.87 | 15.93 |
| 21. | S.2126 | 3.33 | 1906.33 | 90.92 | 80.36 | 20.07 | 2.57 | 18.66 |
| 22. | S.2127 | 3.01 | 1902.55 | 91.53 | 61.54 | 17.62 | 2.41 | 18.12 |
| 23. | S.1659 | 1.87 | 1102.78 | 67.22 | 59.20 | 14.72 | 1.32 | 28.10 |
| 24. | S.1699 | 3.85 | 1337.56 | 80.60 | 38.12 | 15.42 | 0.52 | 30.11 |
| 25. | S.1698 | 1.95 | 908.00 | 71.90 | 34.52 | 13.86 | 0.78 | 38.93 |
| 26. | S.1664 | 1.59 | 709.00 | 79.01 | 58.47 | 15.40 | 0.72 | 42.84 |
| 27. | S.1726 | 1.73 | 923.00 | 70.67 | 50.67 | 16.06 | 1.24 | 43.18 |
| 28. | S.1661 | 2.49 | 7870.67 | 69.00 | 41.71 | 16.04 | 1.29 | 27.52 |
| 29. | S.1663 | 3.05 | 1424.78 | 71.57 | 40.13 | 14.32 | 0.77 | 31.69 |
| 30. | S.1656 | 1.67 | 816.00 | 80.50 | 58.05 | 15.24 | 1.09 | 38.67 |
| 31. | S.1466 | 1.10 | 583.56 | 63.69 | 30.13 | 11.60 | 0.53 | 43.03 |
| 32. | S.1742 | 6.02 | 2658.89 | 97.09 | 77.22 | 19.28 | 2.82 | 13.41 |
| 33. | S.1493 | 2.54 | 1200.78 | 83.08 | 66.72 | 17.71 | 2.65 | 24.66 |
| 34. | S.1476 | 1.02 | 485.89 | 63.48 | 28.27 | 11.26 | 1.09 | 34.41 |
| 35. | S.1768 | 1.06 | 530.22 | 63.55 | 30.68 | 11.51 | 1.52 | 39.47 |
| 36. | S.1470 | 1.59 | 1419.00 | 85.29 | 57.34 | 15.28 | 2.03 | 31.69 |
| 37. | S.1497 | 2.68 | 1311.67 | 90.03 | 67.57 | 17.80 | 2.59 | 20.61 |
| 38. | S.1743 | 4.18 | 1651.67 | 76.68 | 52.85 | 17.76 | 2.38 | 17.74 |
| 39. | S.1470 | 2.31 | 1070.33 | 78.93 | 38.13 | 14.41 | 0.79 | 30.96 |
| 40. | S.1467 | 2.54 | 1103.67 | 71.90 | 38.80 | 15.16 | 0.92 | 24.45 |
| 41. | S.1472 | 2.04 | 943.22 | 78.60 | 37.38 | 13.54 | 0.69 | 31.91 |
| 42. | S.1648 | 2.12 | 552.56 | 63.62 | 33.81 | 15.52 | 1.99 | 26.52 |
| 43. | S.1694 | 1.07 | 969.89 | 72.45 | 29.10 | 11.49 | 1.25 | 37.35 |
| 44. | S.1471 | 2.95 | 1384.56 | 83.62 | 40.47 | 15.56 | 0.94 | 37.55 |
| 45. | S.1468 | 3.27 | 1444.89 | 85.62 | 40.14 | 12.84 | 0.90 | 39.11 |
| 46. | S.1494 | 2.24 | 1083.56 | 81.14 | 44.48 | 15.22 | 1.51 | 32.24 |
| 47. | S.1463 | 3.02 | 1424.78 | 80.27 | 33.45 | 14.69 | 1.44 | 28.57 |
| 48. | S.1464 | 2.51 | 1157.22 | 74.57 | 43.66 | 13.99 | 1.64 | 41.81 |
| 49. | S.1490 | 2.76 | 1103.78 | 69.90 | 36.12 | 15.29 | 1.82 | 38.87 |
| 50. | S.1491 | 2.91 | 1296.00 | 78.60 | 37.47 | 15.42 | 1.94 | 36.22 |
| 51. | S.1492 | 1.63 | 949.78 | 77.15 | 37.12 | 17.40 | 1.81 | 33.97 |
| 52. | S.1504 | 2.95 | 1358.00 | 75.59 | 56.19 | 13.56 | 1.37 | 28.93 |
| 53. | S.1483 | 4.52 | 2108.78 | 89.99 | 75.14 | 18.74 | 2.93 | 25.75 |
| 54. | S.1586 | 2.51 | 1097.11 | 75.24 | 66.89 | 15.31 | 1.37 | 28.83 |
| 55. | S.1905 | 1.69 | 842.89 | 70.00 | 60.51 | 14.92 | 0.91 | 29.76 |

**Table 4. continued . . .**

| S.No. | Genotype | Weight of fruits per plant (kg) | Yield of clean coffee (kg ha-1) | Percentage of fruit fertility | Percentage of 'A' grade beans | Weight of 100 'A' grade beans (g) | Caffeine content (%) | % of rust disease incidence |
|---|---|---|---|---|---|---|---|---|
| 56. | S.1660 | 1.55 | 776.00 | 71.57 | 42.81 | 14.48 | 2.08 | 39.55 |
| 57. | S.1693 | 1.48 | 762.55 | 71.90 | 41.14 | 16.78 | 1.74 | 30.94 |
| 58. | S.1735 | 2.30 | 1057.00 | 74.24 | 53.52 | 15.89 | 0.93 | 46.83 |
| 59. | S.1465 | 1.10 | 607.11 | 63.76 | 26.66 | 11.03 | 0.54 | 41.28 |
| 60. | S.1696 | 1.88 | 903.00 | 76.93 | 43.14 | 14.59 | 0.89 | 15.37 |
| 61. | S.1655 | 2.39 | 1063.55 | 77.14 | 36.99 | 15.98 | 0.92 | 28.52 |
| 62. | S.1695 | 1.68 | 1003.33 | 70.24 | 43.15 | 14.67 | 1.33 | 27.85 |
| 63. | S.1692 | 2.44 | 1070.33 | 78.05 | 37.12 | 14.41 | 1.01 | 33.36 |
| 64. | S.1734 | 1.55 | 769.22 | 76.92 | 62.68 | 15.25 | 0.91 | 43.39 |
| 65. | S.1652 | 1.38 | 763.55 | 68.22 | 40.45 | 14.17 | 0.72 | 23.89 |
| 66. | S.1697 | 2.93 | 1398.00 | 73.58 | 40.13 | 14.61 | 1.75 | 20.57 |
| 67. | S.1662 | 2.03 | 1016.66 | 73.71 | 53.86 | 15.49 | 1.85 | 27.88 |
| 68. | S.1667 | 1.85 | 1006.00 | 73.80 | 44.16 | 14.86 | 1.68 | 30.38 |
| 69. | S.1691 | 1.51 | 781.00 | 71.35 | 43.48 | 16.42 | 1.21 | 28.43 |
| 70. | S.1690 | 2.94 | 1384.56 | 78.93 | 43.59 | 16.09 | 0.97 | 21.30 |
| 71. | S.1591 | 2.14 | 1036.89 | 75.24 | 44.90 | 17.14 | 2.11 | 30.22 |
| 72. | S.1653 | 1.97 | 968.22 | 73.58 | 38.12 | 15.85 | 1.95 | 39.38 |
| 73. | S.1473 | 2.08 | 876.33 | 70.42 | 37.79 | 15.41 | 1.75 | 26.46 |
| 74. | S.1737 | 2.02 | 988.89 | 78.93 | 46.24 | 13.22 | 2.19 | 22.20 |
| 75. | S.1502 | 2.01 | 1003.33 | 70.24 | 55.52 | 15.84 | 0.93 | 26.39 |
| 76. | S.1726 | 1.78 | 903.00 | 68.07 | 43.37 | 15.44 | 1.49 | 18.29 |
| 77. | S.2790 | 4.11 | 1220.78 | 82.95 | 67.90 | 15.09 | 2.11 | 46.82 |
| 78. | S.4349 | 3.81 | 1287.67 | 84.96 | 62.88 | 15.39 | 2.08 | 50.33 |
| 79. | S.4850 | 3.90 | 1144.56 | 82.18 | 73.83 | 17.24 | 2.51 | 8.46 |
| 80. | S.4843 | 5.11 | 2374.56 | 96.23 | 61.53 | 18.21 | 2.73 | 15.25 |
| 81. | S.4854 | 3.17 | 1443.00 | 90.20 | 79.44 | 17.70 | 2.21 | 9.02 |
| 82. | S.4844 | 2.64 | 1711.23 | 90.87 | 68.73 | 17.17 | 1.70 | 15.14 |
| 83. | S.4846 | 2.14 | 769.89 | 86.29 | 67.62 | 17.34 | C2.51 | 7.36 |
| 84. | S.4855 | 4.39 | 2029.00 | 87.09 | 71.91 | 16.43 | 2.63 | 25.00 |
| 85. | S.4847 | 2.01 | 859.22 | 76.92 | 74.37 | 17.18 | 2.42 | 37.97 |
| GM | | 2.5560 | 1290.2587 | 77.8292 | 52.0156 | 15.5057 | 1.5191 | 29.0422 |
| SEd | | 0.5808 | 1038.6230 | 6.4860 | 5.0012 | 1.3806 | 0.2915 | 5.8017 |
| CD (.05) | | 1.1466 | 2050.4943 | 12.8049 | 9.8735 | 2.7257 | 0.5755 | 11.4540 |

leaf area was highest in the genotype Taferikela and Maragogipe (101.18 $cm_3$) (Table 3). As there was higher leaf area, the total photosynthetic surface on per plant basis was higher which in turn increased the total quantity of photosynthates. Similar results were also reported by Selvakumar *et al.* (1992). The genotype Kona showed the lowest leaf area (30.38 $cm_3$) and also the reduction of leaf growth in these genotypes might be due to inhibition of auxin synthesis, inhibition in the rate of assimilation consequent to changes in the specific activity of enzyme and delay in the onset of first mitosis as reported by Arunkumar (2003) in turmeric.

The number of flowers per axil was the highest in the genotypes Taferikala (10.90) (Table 3). This might be due to genetic makeup of these genotype to produce more number of flowers per axil. This is in confirmation with the previous findings of Vishveshwara and Srinivasan (1977) and Thimma Reddy and Srinivasan (1979).

Wide range of variations among the genotypes were observed for the traits *viz*., fruit length and fruit width. The highest mean values for fruit length and fruit width were recorded in Taferikela (23.93 mm) and Maragogipe (17.01 mm). Whereas the genotypes Kona and Murta exhibited the lowest values for fruit length and fruit width. Better fruit characters might be attributed by absorption of nutrients without any hindrance and the nature of genotypes. These results are in corroboration with the findings of Narasimhaswamy (1965) and Srinivasan (1972) in coffee.

Fruit setting percentage and number of fruits per node are important yield attributing characters and have direct influence on yield of coffee (Table 3). These characters could be considered as important traits for selection of genotypes for high yield. Variation in number of fruits per node and percentage of fruit setting were also observed over different seasons by Kumar *et al.* (1994). In the present study, the highest fruit setting percentage was observed in Taffarikela (88.30), Maragogipe (84.72) and Cauvery × Sln.9 (81.68). This might be due to high pollen germination percentage, higher number of flowers produced and size of the flower. Minimum level of fruit setting percentage and number of fruits per node were recorded in Kona followed by Murta, Puerto Rico. Similar results of variability were obtained by Orozco and Nieto (1972), Muluk (1987) and Renuga (1999) in coconut and Srinivasan (1988) in coffee.

The results of the present study revealed that the genotypes Taferikala followed by Maragogipe, Cauvery X Sln.9 and $S_{12}$ Kaffa exerted the highest weight of the fruits per plant and yield of clean coffee (Table 4). This might be attributed to higher bearing area through vegetative growth and number of fruits of the particular genotypes.

From the above results, it could be inferred that the genotypes which recorded the highest yield per plant might be attributed due to the said vegetative frame of these genotypes. The highest branches per plant and length of branches resulted in more vigour of plants which would have resulted in higher number of leaves, leaf area and leaf area index and inturn increases the efficiency of photosynthesis and photosynthetic rate for higher assimilation. Further the genotypes also registered higher number of flowers per plant and fruit setting per cent ultimately increased the yield (Table 4) . Conducive microclimate and soil fertility status are the major determining factors in the potential expression of a particular genotype for growth, development and yield. Of which the relative humidity, light intensity and leaf temperature are the important features which enhances the enzymatic processes in the plant growth and development phase. These high yielding genotypes have the capacity to utilize the environment. On the contrary, low yielding genotypes viz., Kona, Murta, Puerto Rica and Leroy Laurina were less vigorous in growth with poor expression of all the characters does not have the equilibrium with environment. The present finding is in conformity with the earlier results of Vishveshwara and Ahmed (1975), Sadananda and Azizudin (1996) in coffee.

In the present study, the genotypes with higher percentage of ‘A’ grade beans and weight of 100 ‘A’ grade beans were observed in genotype Cioccie followed by Maragogipe in all the three seasons. Whereas, the lowest percentage of ‘A’ grade beans and weight of 100 ‘A’ grade beans were recorded in the genotypes Pache, Kona and Puerto Rico (Table 4). Similar relationship was reported by Ahamed and Srinivasan (1988) and Srinivasan and Subbalakshmi (1984) in coffee.

There was significant variation for caffeine content, Among all the genotypes studied, Higher caffeine content was observed in the genotype Kents followed by Agaro and Maragogipe whereas, the lowest caffeine content was recorded in the genotypes Sumatra and Phillipinean (Table 4). The variation for caffeine content among the genotype might be due to the inherent genome constitution and environmental conditions provided for the particular genotype where it is grown. The dry weather or drought situation may increase the synthesis of the secondary metabolites. The variation in caffeine content might also be due to the effect of temperature, relative humidity and soil factors. This is in concordance with earlier works of Selvakumar and Sreenivasan (1996).

The percentage of rust disease incidence was statistically significant among the genotypes of arabica coffee. The finding of the present study revealed that the genotype Pache exerted the highest level of rust disease incidence followed by Barbuk Sudan, Phillipinean and Murta. The genotype Taferikala registered lesser percentage of rust disease incidence followed by Maragogipe, Cauvery X Sln.9, and S.12 Kaffa (Table 4). This might be due to the differential levels of sensitivity and tolerance possessed by individual genotypes to biotic and abiotic stress factors. These findings are in line with Vishveswara (1971) and Ram *et al.* (1994) who reported that certain genotypes possessed tolerance to diseases in coffee.

## Conclusion

From the study on mean performance of genotypes, based on various growth, yield and quality attributing traits, the genotypes *viz*., Tafarikela, Maragogipe, Cauvery X Sln.9, S.12 Kaffa and Agaro showed high *per se* performance for high yield. These genotypes can be successfully used in breeding programmes for further exploitation.

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