6. SUMMARY

Characterization of Gowli buffaloes of Karnataka was undertaken on the basis of phenotypic, cytogenetic and RAPD markers information. The phenotypic information was compiled on 129 Gowli buffaloes maintained by farmers in the villages within the breeding tract. For cytogenetic studies, 5 ml of blood was collected from 12 animals of both sexes, while 10 ml of blood was collected from 50 animals each of Gowli and South Kanara buffaloes for RAPD–PCR study.

Gowli buffaloes constitute around 30 per cent of the total buffalo population in the breeding tract. The colour of the skin, hair coat and muzzle was black. The tail switch colour was white. The head was long and tapering carried a little high with a straight and narrow forehead. The horns were long, flat and sweeping in nature, projected laterally from the poll backwards and downwards, running parallel to the neck, growing upwards and crossing the shoulder blade. The horns ended up with sharp upward turned points. The ears were long and tubular and always bearing a varietal cutting as identification marks by the farmers. The hindquarters were set little low as compared to forequarters, while the rump region was broad and sloping. The tail was moderately long and perfectly set, hanging downward just below the hock joint and never touched the ground.

The mean value of face length, face width and ear length was 50.63 ± 0.68 and 50.33 ± 1.42, 21.53 ± 0.62 and 18.33 ± 0.73, and 21.23 ± 0.83, 21.00 ± 0.76 cm in adult females and breeding bulls, respectively. The poll distance and horn length averaged 21.41 ± 0.58 and 20.33 ± 0.33 cm and 79.16 ± 2.44 and 76.00 ± 3.69 cm in
females and breeding bulls, respectively. The ear length averaged 21.00 ± 0.76 cm in breeding bulls and 21.23 ± 0.83 cm in females of age 4 years and more. The average height at withers for adult females and breeding bulls were 124.9 ± 1.20 and 124.0 ± 1.73 cm, respectively, while the corresponding values were 136.1 ± 1.51 cm and 129.3 ± 4.51 cm for body length, 189.4 ± 2.11 cm and 171.0 ± 7.00 cm for heart girth, and 206.9 ± 1.86 cm and 177.0 ± 4.65 cm for body girth.

The respective mean value for adult females and breeding bulls for height at point of elbow was 67.09 ± 0.69 and 68.00 ± 1.32 cm, while that of mean height at hip bone was 120.1 ± 0.91 and 122.3 ± 2.85 cm and that of height at pin bone were 112.1 ± 0.90 and 113.7 ± 1.92 cm. The corresponding average values for rump slope were 7.92 ± 0.54 and 8.67 ± 1.01 cm, respectively. The mean distance between the pin bones was 28.52 ± 0.85 and 19.67 ± 0.44 cm, and for distance between hip bones, the value was 47.68 ± 0.84 and 42.67 ± 1.17 cm in adult females and breeding bulls respectively.

The mean hock height was respectively, 46.39 ± 0.46 and 45.67 ± 0.73 cm, for females and breeding bulls. The average tail length was 81.19 ± 1.06 and 85.33 ± 2.17 cm, in the females and breeding bulls, respectively. The teat length averaged 7.80 ± 0.21 cm. The peak milk yield averaged 7.75 ± 0.26 litres/day.

Chromosome analysis of Gowli buffaloes revealed a modal chromosome number of 2n = 50. The chromosomes consisted of 24 pairs of autosomes and two sex chromosomes. The karyotype comprised of 5 pairs of submetacentric and 19 pairs of acrocentric autosomes and a pair of acrocentric sex chromosomes. All the five
biarmed pairs of chromosomes were identified easily. The X chromosome was the largest acrocentric. The Y chromosome was identified as the smallest acrocentric.

The mean relative length (%) of the autosomes varied from $1.70 \pm 0.09$ to $7.90 \pm 0.17$. The X chromosomes contributed 6.0 per cent of the haploid genome while contribution of Y chromosome was 1.51 per cent. The mean relative length of X chromosome was approximately equal to that of 4th pair of autosomes.

Mean comparisons revealed highly significant ($P \leq 0.01$) differences for 1st and 2nd biarmed chromosomes, while it was significant ($P \leq 0.05$) for the 3rd, 4th, 7th, 8th, 9th, 10th and 12th pairs of autosomes.

The centromeric index value was highest for fifth pair ($38.49 \pm 1.08$ in males and $36.82 \pm 1.25$ in females) and it was lowest for first pair of autosomes ($26.19 \pm 0.88$ in males and $29.37 \pm 0.96$ in females). The index value for third pair followed the fifth pair. The centromeric index values for fourth and second pairs of autosomes were intermediate. The fifth pair was more metacentric than submetacentric. The first pair of autosomes had the smallest short arm among all the biarmed autosomes. Testing of means of centromeric index of all the five biarmed chromosomes revealed highly significant difference of sex for the fourth pair, while significant differences were observed for the first and second pairs of biarmed chromosomes. The G-band patterns were in close agreement with the G-band features reported earlier in river type buffaloes.
Out of the ten random primers used for amplification of genomic DNA, eight primers (ILO 868, ILO 876, OPG 05, OPG11, OPG 13, OPAV 15, OPAX 19 and BG 28) amplified Gowli buffalo genomic DNA. All the primers used were found to produce consistent polymorphic banding patterns. Primer OPAX was found to produce only one fragment in Gowli buffaloes and was least useful in breed characterization.

The number of RAPD bands with the different primers in Gowli and South Kanara buffaloes was found in the range of one to ten and four to thirteen, respectively. Size of the PCR products varied from 270 to 1742 bp in Gowli buffaloes and 270 to 1859 bp in South Kanara buffaloes.

Primer ILO 868 was found to be moderately polymorphic. Three fragments of lengths 1064 bp, 1393 bp and 1755 bp were produced in South Kanara buffaloes, which were not seen in Gowli buffaloes.

Primer 876 was found to be moderately polymorphic. Six fragments ranging from 369 to 1265 bp were produced in Gowli buffaloes. Along with these fragments, two additional fragments of sizes 502 and 862 bp were observed in South Kanara buffaloes.

Primer OPG 05 was found to be moderately polymorphic. Two out of eight fragments produced with primer OPG 05 were detected only in South Kanara buffaloes.

Primer OPG 11 was found to be less polymorphic. A distinct band of about 918bp was amplified in Gowli buffaloes but not in South Kanara buffaloes.
The primer OPG 13 produced maximum number of bands in both the breeds, with ten fragments being detected in Gowli and thirteen fragments in South Kanara buffaloes. Fragments of size 1136, 543 and 484 bp were amplified only in South Kanara buffaloes.

Primer OPAV 15 was next to OPG 13 in the number of bands produced, with eight and nine bands, respectively, in Gowli and South Kanara buffaloes. A breed specific fragment of 850 bp was detected only in South Kanara buffaloes.

Primer OPAX 19 was found to be the least polymorphic, with only one fragment of size 430 being detected in Gowli buffaloes. In the South Kanara buffaloes, in addition, four other fragments of size 817, 672, 622 and 303 bp were detected.

Primer BG 28 was found to be highly polymorphic. Fragment 713 bp was amplified only in South Kanara buffaloes.

Of the eight primers, Primers ILO 868, ILO 876 and BG 28 were found to be useful for differentiating Gowli and South Kanara buffaloes, with primer ILO 876 being the primer of choice.