JUNAGADH AGRICULTURAL UNIVERSITY

RESEARCH RECOMMENDATIONS FOR SCIENTIFIC COMMUNITY

VI. ANIMAL SCIENCE

Total 45 scientific recommendations developed by animal science disciplines as described below.

Year: 2011-2012

1. Impact of herd composition on herd performance traits in Gir cattle

Maintaining an established breeding herd of an average of 110 Gir cows in South Saurashtra region results in an average of 388 (i.e. 400) total heads, 260 total adult units and 72 % total female population with 85 (22 %) breedable heifers, 80 (21 %) growing females below 2 years of age and 63 (57 % total cows) milch cows with wet average of 6.8 lit., herd average of 3.8 lit. and return of 116 % over feed cost**.** Herd structure and performance vary significantly by year. Month significantly influences calving rate and herd average. Wet average (7.2 vs 6.1 lit), herd average (4.2 vs 3.4 lit) and % milch cows (57-60 vs 54-55 %) remain higher from March to May and lower during August-September months. Performance traits show negative trend with number of cows, total breedable females and total heads present in the herd. Hence, optimum herd structure should be maintained for higher performance and return.

2. Breeding and lactation efficiencies of Gir cows

In organized large dairy herd of Gir cattle in South Saurashtra region-i) Over all breeding efficiency, lactation efficiency, age at first calving, calving interval and lactation period of Gir cows were 86.9±0.5 %, 61.1±1.1 1527.8 ± 14.2 (50.1 mo.), 481.2 ± 4.9 (15.8 month) and 281.0 ± 4.6 days, respectively. About 29 % of heifers calved for the first time below the average age of 44 months and 38 % of cows calved at an average calving interval of 14 months. ii) Average milk production of Gir cows increased with increase in parity and reached peak of 2300 lit of 300-d milk yield in 5^{th} lactation. In subsequent lactations also, 300-d lactation milk yield remained between 1950 and 2100 lit up to 8th lactation which indicated high persistency of production over parity. Productive life of cows averaged 8.5 years (i.e., 3108 days) with 10,000 lit life time milk production with an average of 4.3 calving during lifetime. iii) About 19 % Gir cows remained in the herd for more than 12 years of age (on an average 14.6 years) and more than 25 % of cows performed in the herd for more than 6 lactations. Hence, breeding goals of less than 44 months of age at first calving and 14 months of calving interval may be set for Gir cattle.

3. Breeding and lactation efficiencies of Jaffrabadi buffaloes

In organized large dairy herd of Jaffrabadi buffaloes in South Saurashtra region-i) Over all breeding efficiency, lactation efficiency, age at first calving, calving interval and lactation period of Jaffrabadi buffaloes averaged 79.0 ± 1.5 %, 58.2 ± 1.6 %, 1656.7 ± 28.6 (54.3 month), 541.9 ± 7.9 (17.8 month) and 291.9 ± 5.0 days, respectively. About 28 % of heifers calved for the first time below the average age of 47 month and 31 % of buffaloes calved at an average calving interval of 15 months**.** ii) Average milk production of Jaffrabadi buffaloes increased with increase in parity and reached peak of 1900 lit of 300-d milk yield in 4^{th} lactation. In subsequent lactations also, 300-d lactation milk yield remained between 1700 and 1800 lit up to 6^{th} lactation which indicated high persistency of production over parity. Productive life of buffaloes averaged 10.1 years (i.e., 3701 days) with 8500 lit life time milk production with an average of 4.7 calving during life time. iii) About 20 % Jaffrabadi buffaloes remained in the herd for more than 12 years of age (on an average 16.6 years) and more than 38 % of these animals performed in the herd for more than 6 lactations. Hence, breeding goals of less than 47 months of age at first calving and 15 months of calving interval may be set for Jaffrabadi buffaloes.

(*Cattle Breeding Farm, JAU, Junagadh*)

Year: 2012-2013

4. Management of sub-estrus condition in post-partum buffaloes through hormonal therapy

The field veterinarians are informed that synthetic analogue of Prostaglandin ($PGF_2\alpha$) when injected @ 2 ml i/m in post-partum subestrus Jaffarabadi buffaloes helps in the regression of corpus luteum within an average period of 2 to 3 days.

(*Cattle Breeding Farm, JAU, Junagadh*)

Year: 2013-14

5. Estimation of Bulk milk Somatic Cell Count (SCC) from the raw milk of Gir cattle and Jaffrabadi buffalo

The scientific community is informed that average bulk tank milk somatic cell count - BTMSCC/ ml milk of Gir cows (720,278 SCC/ml) and Jaffrabadi Buffaloes (623,625 SCC/ml) were lower than the US standards for "Grade A" milk (750,000 SCC/ml) without significant effect of season and time of milking in organized dairy farm.

(*Cattle Breeding Farm, JAU, Junagadh*)

6. Incidence of parasitic infections in bovines in and around Junagadh city

The veterinary professionals are informed that cattle and buffalo in and around Junagadh region were found predominately infected with *Toxocara vitulorum*, *Fasciola* spp., strongyles, *Strongyloides papillosus*, amphistomes, coccidia (*Eimeria* spp. and *Cryptosporidium* spp.) and *Buxtonella sulcata* (ciliates) parasites.

(*Dept. of Vet. Parasitology, College of Vet. Science & A. H., JAU, Junagadh***)**

7. Abattoir survey of reproductive abnormalities in Jaffrabadi buffaloes (*Bubalus bubalis*)

It is informed to scientific community that about half of the culled Jaffrabadi buffaloes have acquired cervical affections, which include kinked cervix (72.6 %) and cervical ectropion (25.8 %) as major abnormalities which should be noted as a point of concern by scientific community.

(*Dept. Vet. Gyn. & Obst., College of Vet. Science & A. H., JAU, Junagadh***)**

Year: 2014-15

8. Survey on ethno-veterinary practices and preliminary evaluation of antibacterial activity of commonly used plants for animal health in Junagadh district

Methanol extract of *Prosopis juliflora* (Gando Baval) leaves at the concentration of 200 mg/ml has good *in vitro* antibacterial activity against bacterial isolates from animals, *viz.*, *Escherichia coli*, *Streptococcus agalactiae* and *Staphylococcus aureus*.

(*Dept. of Vet. Pharmacology & Toxicology, College of Vet. Science & A. H., JAU, Junagadh*)

9. Radio-anatomy of heart size in mongrel dogs using Vertebral Heart Score system

The normal VHS for mongrel dogs is 8.0 to 11.1 V. The deviation from this range may indicate cardiac abnormalities.

(*Dept. of Veterinary Surgery & Radiology, College of Veterinary Science & A. H., JAU, Junagadh*)

10. Histomorphometry & histochemical observations on the ovaries of Jaffrabadi buffaloes in different season of year

In Jaffrabadi buffaloes, based on biometrical and micrometrical observations, higher functional activities of ovaries are observed in winter season.

(*Department of Veterinary Anatomy, College of Veterinary Science & A. H., JAU, Junagadh*)

11. Molecular characterization of Interleukin-8 (IL-8) gene in Jaffrabadi Buffalo (*Bubalus bubalis*)

It is recommended to use following primers for the study of IL-8 gene involved in mastitis resistance.

List of Primers

Sr. No.	Primer Sequence 5'-3'	Primer length (bp)
Primer 1	Forward 5'-GGGCGGAGGTTGCGTATT-3' Reverse 5'-TAAGAGGGATCCCAGTAAGGTTT-3'	18 23
Primer 2	Forward 5'-GACGAGCTTCAGGCAACTATCA-3' Reverse 5'-ATATTAAATGCCATGGAGACAAA-3'	22 23
Primer 3	Forward 5'-TGGAAGAATCCAGCAAAGTTC-3' Reverse 5'-TGACAGAAGGCACAGGCATA-3'	21 20

Primer 4	Forward 5'-CCAATCGATCTGGAAATCCT-3' Reverse 5'-TGACTAAGAGGTCTTTCTGTTTGTG-3'	20 25
Primer 5	Forward 5'-ACAAACAGAAAGACCTCTTAGTCA-3' Reverse 5'-CAAACTCCTGATGACTCTGACA-3'	25 22

12. Molecular characterization of Toll like Receptor 4 (TLR-4) gene in Jaffrabadi Buffalo (*Bubalus bubalis*)

Allele B is more frequent than allele A for *TLR-4/ALU I* gene and use of following primers is recommended in Jaffarabadi buffaloes.

Exon(s)	Sr. No.	Primer Sequence 5'- 3'	Amplicon Size (bp)
Exon 1	Primer-1	Forward 5'-CACAGAGCCACTTCTGGTCA-3' Reverse 5'- TTTTCAGAAGCAAGGCCAAG-3'	180
Exon 2	Primer-2	Forward 5'- ACCTGAGCTTTAACTACCT-3' Reverse 5'-AATATTTCTGCTGAATAGGA-3'	280
Exon 3	Primer-3	Forward 5'-CTGGGCTCTCAAGTTTACGG-3' Reverse 5'-AACCAGCCGGTTGATTTTTA-3'	410
	Primer-4	Forward 5'-GGCTGGTTTTGGGAGAATTT-3' Reverse 5'-TGTGAGAACAGCAACCCTTG-3'	420
	Primer-5	Forward 5'-CAAGGGTTGCTGTTCTCACA-3' Reverse 5'-GAGCGAGTGGAGTGGTTCAT-3'	478
	Primer-6	Forward 5'-TGCTCCCTGACATCTTCACA -3' Reverse 5'-TCTGACAAGTGGCATTCCTG-3'	440
	Primer-7	Forward 5'-TCAGGAATGCCACTTGTCAG-3' Reverse 5'-CAGGTCTGGGCAATCTCATA-3'	406
	Primer-8	Forward 5'-CCAGAGCCGATGGTGTATCT-3' Reverse 5'-CACTGAATCACCGGGCTTT-3'	410
	Primer-9	Forward 5'-GGTAAACCCACGAGTCCAGA-3' Reverse 5'-CCCCCGGGAAGTTCTATATT-3'	286

(*Dept. of Animal Genetics & Breeding, College of Veterinary Science & A.H., JAU, Junagadh*)

13. The retrieval rate and grading of oocytes from ovary of culled Jaffrabadi buffaloes

Higher recovery rate and good quality oocytes can be obtained from ovaries without CL (Corpus Luteum) in Jaffrabadi buffalo using slicing method.

(*Dept. of Vet. Gynecology & Obstetrics, College of Veterinary Science & A. H., JAU, Junagadh*)

14. Comparative study on efficacy of different medicaments for induction of estrus in true anestrous Jaffrabadi heifers (*Bubalus bubalis*)

The true anoestrus Jaffrabadi buffalo heifers of 3 to 3.5 body condition score responded well to CIDR or ovosynch-protocol in terms of estrus induction and conception rate.

(Dept. of Vet. Gynaecology & Obstetrics, College of Veterinary Science & A. H., JAU, Junagadh)

15. Association of milk components with intra-mammary infection in Jaffrabadi Buffaloes

The milk lactose and milk urea nitrogen are found to be decreased in Jaffrabadi buffaloes with mastitis.

(*Dept. of Livestock Production management, College of Vet. Science & A. H., JAU, Junagadh*)

Year: 2015-16

16. Preliminary evaluation of antibacterial activity of extracts of *Cassia auriculata, Prosopis juliflora* and *Annona squamosa*

Alkaloid rich fractions of *Prosopis juliflora* leaves can be a good drug entity against resistant bacteria due to its antibacterial property against various bacteria including Methicillin-Resistant *Staphylococcus aureus*.

17. Survey on indigenous plants use for medicinal purpose in animals in Junagadh region

Farmers of Junagadh, Mendarda and Vanthali taluka are commonly using *Adansonia digitata* (Gorakh ambli) for gastric problems, *Elephantopus scaber* (Ghaa Jadvu) and *Clerodendrum phlomidis* (Arni) for wound healing, *Psoralea corylifolia* (Baauchi) for skin infection, *Enicostemma littorale* (Mamejvo) for internal parasites and *Tecomella undulata* (Ragat rohido) for fracture healing in animals.

(Dept. of Vet. Pharmacology & Toxicology, College of Vet. Science & A. H., JAU, Junagadh)

18. Assessment of blood cells' immunocompetence around parturition in Gir cows and Jaffarabadi buffaloes

During peripartum period phagocytic activity and lymphocyte proliferation responses are lower in Gir cows as compared to Jaffarabadi buffaloes.

19. Haemato-biochemical profiles of horses in and around Junagadh

In Kathiawadi horses, total granulocyte per cent and MCHC (g/dl) are higher in females and lymphocyte per cent higher in males.

(Dept. of Veterinary Physiology & Biochemistry, College of Vet. Science & A. H., JAU, Junagadh)

20. Diagnosis of *Babesia bigemina* and *Trypanosoma evansi* in bovines in and around Junagadh: traditional vs molecular detection and assessment of risk factors

In cattle and buffaloes PCR is the most effective technique in diagnosis of subclinical and latent infections of *Babesia* spp. (Sensitivity, 100 %; Specificity, 82.90 %) and *Trypanosme* spp. (Sensitivity, 100 %; Specificity, 95.92 %).

21. Study of parasitic infections/infestations in animals presented at TVCC, Junagadh

The major parasites recorded in domesticated animals in and around Junagadh are as below:

Name of Parasite	Animal species
Buxtonella sulcata, *Eimeria* spp., *Fasciola gigantica*, *Aamphistomes*, *Babesia* spp.	Cattle, Buffaloes
Eimeria spp.	Goat, Bird
Strongyle , *Babesia* spp.	Horse
Hook Worm, *Babesia* spp., Demodex	Dog
Trypanosoma evansi	Camel

(Department of Veterinary Parasitology, College of Vet. Science & A. H., JAU, Junagadh)

22. Effect of replacement of graded levels of maize with raw and detoxified mango seed kernel (*Mangifera indica*) in conventional concentrate mixture on *in vitro* rumen fermentation pattern

Total phenol content in raw mango seed kernels is reduced by 60.00 per cent and 70.40 per cent by boiling in water and treatment with 1.00 per cent calcium hydroxide, respectively. Based on *in vitro* studies, treated mango seed kernel can replace 100 per cent maize in ISI grade-II concentrate mixture for cattle.

(Department of Animal Nutrition, College of Vet. Science & A. H., JAU, Junagadh)

23. Aetio-pathological studies on broiler mortality in and around Junagadh

E. coli infection is the major cause (31.21 per cent) of mortality in broilers of 16-30 days (22.55 per cent) during winter (22.40 per cent) in and around Junagadh.

(Department of Veterinary Pathology, College of Vet. Science & A. H., JAU, Junagadh)

24. Study on postnatal development of adrenal gland in gohilwadi goat (*Capra hircus*)

Adrenal gland of day old Gohilwadi kid has definite foetal cortex and medulla, while adult adrenal exhibits the structures of typical zones of cortex and medulla. Width of definite cortex increases, while that of foetal zone decreases with increasing age.

(Department of Veterinary Anatomy, College of Vet. Science & A. H., JAU, Junagadh)

Year: 2016-17

25. Preliminary evaluation of antibacterial activity of extracts of selected medicinal plants

Methanolic and chloroform extracts of leaves of *Aristolochia longa* (*Kidamari*), *Adansonia digitata* (*Gorakhamli*), *Solanum xanthocarpum* (*Bhoi-ringani*), *Moringa oleifera* (*Saragavo*) and *Syzygium cuminii* (*Kala-jambu*) were found to have significant *in-vitro* antibacterial activity.

	
Adansonia digitata	***Aristolochia longa***

26. *In-vitro* anti-inflammatory activity of selected medicinal plants

Extracts from *Argyreia speciosa* leaves (*Avali-savali*), *Adansonia digitata* leaves (*Gorakh ambli*), *Flueggea leucopyrus* leaves, *Peltophorum pterocarpum* bark (*Pilo gulmohor*), *Solanum xanthocarpum* aerial part (*Bhoi-ringani*) and *Vitex negundo* leaves (*Nagod*) showed significant *in-vitro* anti-inflammatory activity.

	
Argyreia speciosa	***Vitex negundo***

27. In-vitro antioxidant activity of extracts of selected medicinal plants

Opuntia elatior (*Hathlothor*) fruit extracts of *Peltophorum pterocarpum* (*Pilo gulmohor*) leaves and bark, *Syzygium cuminii* (*Kala-jambu*) leaves and *Tridax procumbens* (*Ghaburi*) leaves showed significant *in-vitro* antioxidant activity.

	
Opunita elatior	*Syzygium cumini*

28. In-vitro anti-diabetic activity of extracts of selected medicinal plants

Extracts of *Gymnema sylvestre* (*Madhu nashini*), *Lepidium sativum* seed (*Sheliyo*), *Moringa oleifera* (*Saragavo*) leaves and *Pueraria tuberosa* (*Fagiyo*) tuber showed significant *in-vitro* anti-diabetic activity by inhibition of α-amylase and α-glucosidase enzyme activity.

	
Gymnema sylvestre	*Lepidium sativum* seed

(Department of Vet. Pharmacology & Toxicology, College of Vet. Sci. & A.H., JAU, Junagadh)

29. Effect of various levels of some herbal feed additives in total mixed ration on *in vitro* nutrient utilization and rumen fermentation

Garlic bulb powder, fenugreek seed powder and *ashwagandha* root powder can be incorporated at 0.5 % level and ginger rhizome powder at 1 % level in total mixed rations to improve *in-vitro* degradability and rumen fermentation.


(Department of Animal Nutrition, Coll. of Vet. Sci. & A.H., JAU, Junagadh)

30. Study of acaricidal resistance status and species of ticks infesting animals presented at TVCC, Junagadh

In Saurashtra region, major ticks of cattle, buffaloes and horses is *Rhipicephalus microplus* (>85 %) and of dog *R. sanguineus* (≈100 %); where in *R. microplus* shows moderate resistance (level II) against deltamethrin and against ivermectin, but susceptibility to cypermethrin. Moderate resistance against ivermectin is also recorded in *R. sanguineus*.

(Department of Vet. Parasitology, Coll. of Vet. Sci. & A.H., JAU, Junagadh)

Year: 2017-18

31. Evaluation of *in-vitro* antibacterial, anti-inflammatory, antioxidant and anti-diabetic effects of medicinal plants

Crude alkaloid fraction from *Cassia absus* has *in-vitro* antibacterial activity against *Escherichia coli, Salmonela typhimurium, Streptococcus agalactiae* and *Staphylococcus aureus.*

32. Evaluation of *in-vitro* antibacterial, anti-inflammatory, antioxidant and anti-diabetic effects of medicinal plants

Aqueous extract of *Operculina turpethum* leaves and hydro alcoholic extract of *Sphaeranthus indicus* fruit have *in-vitro* anti-inflammatory activity.

33. Evaluation of *in-vitro* antibacterial, anti-inflammatory, antioxidant and anti-diabetic effects of medicinal plants

Aqueous, alcoholic and hydro alcoholic extracts of *Cressa cretica* leaves have *in-vitro* antioxidant activity.

34. Evaluation of *in-vitro* antibacterial, anti-inflammatory, antioxidant and anti-diabetic effects of medicinal plants

Hydro alcoholic extract of *Luffa echinata* fruit, *Pterocarpus marsupium* bark and extracts of *Cressa cretica* leaves have *in-vitro* anti-diabetic activity.

35. Evaluation of healing potential of polyherbal formulation on full-thickness skin wounds in rabbits

Polyherbal formulation containing gel of *Aloe vera* (1 %), defatted alcoholic extract of leaves of *Argyreia speciosa* (0.25 %), hydro alcoholic extract of bark of *Ficus racemosa* (0.25 %), aqeous extract of leaves of *Prosopis juliflora* (1.5 %) and *Tridax procumbens* (0.5 %) has wound healing effect in full-thickness skin excision wound in rabbits polyherbal formulation containing gel of *Aloe vera*, defatted alcoholic extract of leaves of *Argyreia speciosa*, hydro alcoholic extract of bark of *Ficus racemosa*, aqeous extract of leaves of *Prosopis juliflora* and *Tridax procumbens* has wound healing effect in full-thickness skin excision wound in rabbits

36. Effect of piperine pre-conditioning on pharmacokinetics of marbofloxacin following subcutaneous administration in rats

Oral administration of piperinedoes not alters the pharmacokinetics of subcutaneously administered marbofloxacin in rats.

(Department of Veterinary Pharmacology and Toxicology, CV Sci. & A.H., JAU, Junagadh)

37. Seroprevalence of Infectious Bbovine Rhinotracheitis (IBR) in dairy animals with reproductive disorders

Due to high (more than 30 %) seroprevalence of IBR in Saurashtra region, it is advisable to take preventive & control measure.

38. Hematological and biochemical aspects associated with haemoprotozoan infection in cows, buffaloes and horses

Hemoprotozoan infection in cows, buffaloes and horses causes anemia with significant increase in serum AST & ALT levels as well as significant change in SOD & MDA levels indicating oxidative stress and oxidative damage.

(Department of Veterinary Public Health, CV Sci. & A.H., JAU, Junagadh)

39. Effect of methyl ergometrine and PGF2α during puerperium period in Gir cows

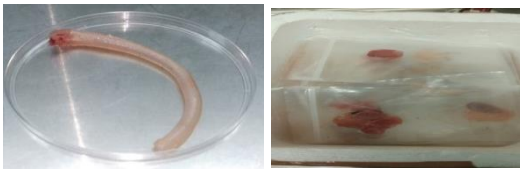
It is recommended that a single dose of PGF2α immediately after parturition in Gir cows enhances the process of placental separation, hastens the uterine involution, decreases the service period and increases the conception rate.

(Cattle Breeding Farm, JAU, Junagadh)

Year: 2018-19

40. Ecological studies of *Staphylococccus aureus* isolates from poultry meat and associated environment in and around Junagadh district

A total of 27(13.5 %) isolates of *Staphylococcus aureus* were recovered from samples collected from poultry raw meat, knife and hands of poultry meat handlers in and around Junagadh district. Among isolates, 19 (70.37 %) and 17 (62.96 %) were resistant to tetracycline and ampicillin, respectively.



(Dept. of Vet. Public Health and Epidemiology, College of Vet. Sci. & A.H., JAU, Junagadh)

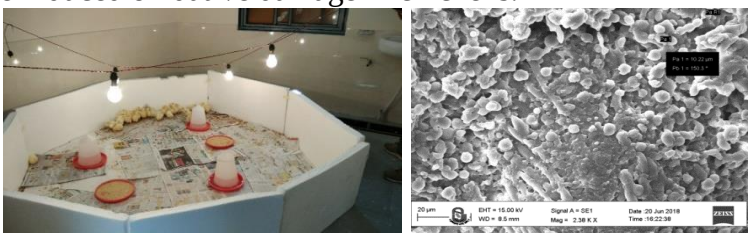
41. Etiological and Therapeutic studies on Canine Dermatoses in and around Junagadh

Higher prevalence of dermatoses are seen in Pug, Labrador and Doberman in the age group of 4 -5 years during summer and monsoon seasons with higher Staphylococcal infection (80.33 %) followed by *Streptococcus* Spp. (11.48 %) and *Micrococcus* Spp. (8.2 %) which favourably responded to Amoxicillin - Sulbactum or Cefaperazone - Sulbactum antibiotics.

(Dept. of Teaching Vet. Clinical Complex, College of Vet. Sci. & A.H., JAU, Junagadh)

42. Evaluation of an antioxidant effect of poly-herbal mixture against cadmium induced oxidative stress in chickens

Addition of poly-herbal mixture (2 %) comprising of powders of fruits of *Opuntia elatior* Mill. (Hathlo thor) *and Sphaeranthus indicus* (L.) (Gorakh Mundi); leaves of *Peltophorum pterocarpum* (DC) Baker ex DC, (Pilo Gulmohar), *Syzygium cuminii* (L.) Skeels (Kala Jambu) and *Cressa cretica* (L.) (Rudravanti); aerial part of *Withania somnifera* (L.) Dunal (Ashwagandha) *and Solanum xanthocarpum* Schrad. & Wendl (Bhoi ringani) at equal proportions in feed ameliorates the cadmium chloride induced oxidative damage in chickens.



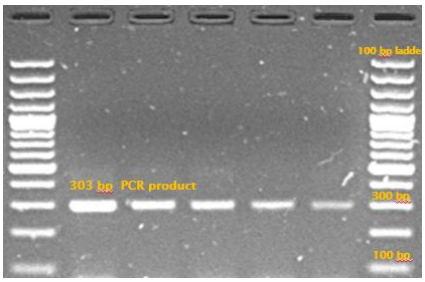
(Dept. of Vet. Pharmacology & Toxicology, College of Vet. Sci. & A.H., JAU, Junagadh)

43. Principal component analysis to predict the herd life using first lactation traits in Gir cattle

The first lactation records *viz.*, AFC, FLL and DP can be used to predict herd life up to five lactations using MLR equation HLFL= 608.64 + (1.18×AFC) + (2.08×LL) + (1.33×DP) explaining 70 % of underlying variance (Adjusted R^2=0.694). The explained variance (R^2=0.687) for estimating herd life up to five lactations using PCA can be invariably be used using regression equation HLFL=3422.69 + (468.15 × FAC1) + (127.63×FAC2) with added advantage of nullifying collinearly among independent variables.

44. Molecular characterization of BoLA-DRB3 gene in Gir cattle

Partial exon II of DRB 3 gene amplified with reported HL 030 (5'-ATCCTCTCTCTGCAGCACATTTCC-3') and HL 031 (5'-TTTAATTCGCGCTCACCTCGCCGCT-3') primers showed high variation (~22%) and polymorphism in sampled Gir cattle population. *Pst I, EcoR V* and *Sal I* restriction enzymes showed their restriction sites in analyzed sequences which can be further used for genotyping and association studies.



(Dept. of Animal Genetics and Breeding, College of Vet. Sci. & A.H., JAU, Junagadh)

45. Studies on nutritive value and feeding varying levels of Marvel (*Dicanthium annulatum*) grass on milk production and milk composition in lactating Gir cows

Marvel/Jinjavo *(Dicanthium annulatum)* grass has 8.65 % Digestible Crude Protein (DCP) and 61.83 % Total Digestible Nutrients (TDN). Chemical composition of Marvel/Jinjavo grass: Crude protein-13.4 %, Crude fibre-32.8 %, Crude fat-2.1 %, DCP-8.65 % and TDN-61.83 %.

(Cattle Breeding Farm, JAU, Junagadh)