Reduction in metabolic disorders in dairy cattle on feeding a balanced ration

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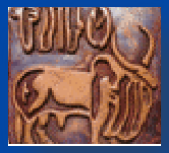


Demand for food to feed the world

- Increasing demand for food to feed the world's growing population is persistent.
- It is estimated that by 2050, the world's demand for animal products would increase by 60-70% (FAO, 2012).
- Most of this increase in demand would be in developing countries, and is expected to be met from the available feed resources, in an environmentally sustainable manner.
- Large scale implementation of strategic measures to Improve milk production efficiency in tropical & sub-tropical smallholder dairy production systems is the need of the hour.

Measures to reduce metabolic & reproductive disorders through feeding a balanced ration

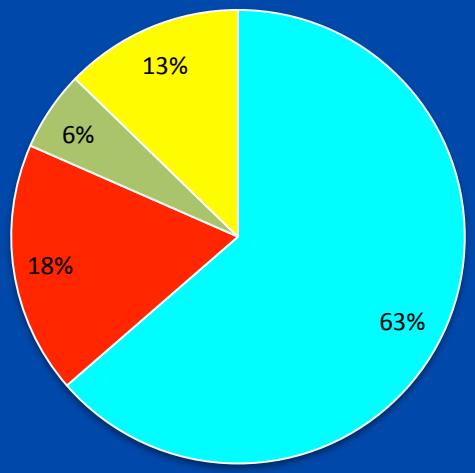
Breedable population & % in-milk animals

Particular	Indi. cows	CB cows	Buffaloes
Total breedable population (in million)	52.20	20.42	54.05
In-milk animals (in million)	29.60	14.20	36.56
% in milk animals of the total breedable population	57	69	67

Source:*Livestock Census, 2012)

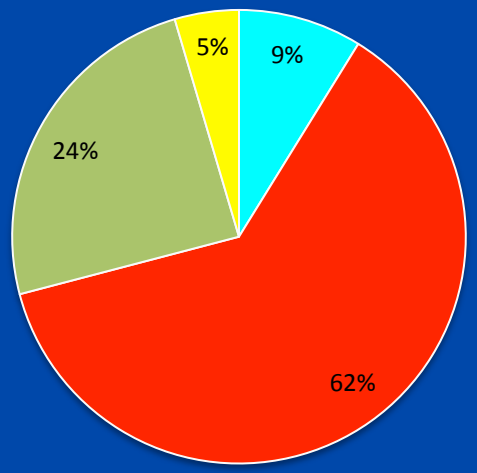
Nutritional status of lactating cows & buffaloes (n=1.5 million)

Nutritional Status for CP and ME



- Excess in both CP and ME
- Deficit in both CP and ME
- Excess in CP and Deficit in ME
- Deficit in CP and excess in ME

Nutritional Status for Ca and P



- Excess in both Ca and P
- Deficit in both Ca and P
- Excess in Ca and Deficit in P
- Deficit in Ca and excess in P

Economic impact of feeding a balanced ration to cows & buffaloes (n=1.5 million)

Parameter	Before RBP	After RBP	Change
Average milk production (kg/ animal/day)	7.53	7.80	+0.27
Average fat % in milk	4.64	4.74	+0.10
Average cost of feeding (Rs./kg milk)	17.00	14.97	-2.03
Increase in net daily income (Rs./animal)			24.0

Effect of feeding a balanced ration on SNF content of milk in crossbred cows & Murrah buffaloes

Parameter	Cows			Buffaloes		
	Before RB	After RB	Change	Before RB	After RB	Change
Average milk production (kg/ani./day)	9.35	10.18	+0.83	7.5	8.1	+0.60
Average fat % in milk	4.13	4.26	+0.13	6.5	6.9	+0.40
Average cost of feeding (Rs./kg milk)	13.99	13.28	-0.71	17.6	17.3	-0.30
Average SNF % in milk	7.87	8.62	+0.75	8.1	9.21	+1.09

RB= Ration balancing

Feeding trial on supplement to reduce incidence of sub-clinical mastitis in CB cows

- Sub-clinical mastitis is 30-40% higher than clinical mastitis, which can be minimized through proper hygiene & by feeding vitamins & minerals based supplement prior to calving.
- A feed supplement was formulated & fed daily @ 10 g per head to 230 CB cows for nearly 4 weeks prior to calving, with a history of clinical or sub-clinical mastitis.
- On feeding the supplement, incidences of sub-clinical mastitis in these cows post calving was reduced by 80%.

Effect of supplement on different parameters

Particular	Control affected animals (n=46)	Experimental unaffected animals (n=184)
Blood neutrophils (%)	60[a]	31[b]
Serum IgG (mg/ml)	23[a]	29[b]
Serum FRAP (µM/l)	689[a]	1457[b]
Milk pH	7.07[a]	6.60[b]
Electrical conductivity (mS/cm)	7.14[c]	4.34[d]
Somatic cell counts ($\times 10^5$/ml of milk)	8.74[c]	2.86[d]
Milk FRAP (µM/l)	378[a]	1128[b]
Na (mg/dl)	126[a]	61[b]
Cl (mg/dl)	168[a]	115[b]
K (mg/dl)	128[a]	138[b]
Lactose (%)	3.95[a]	4.68[b]

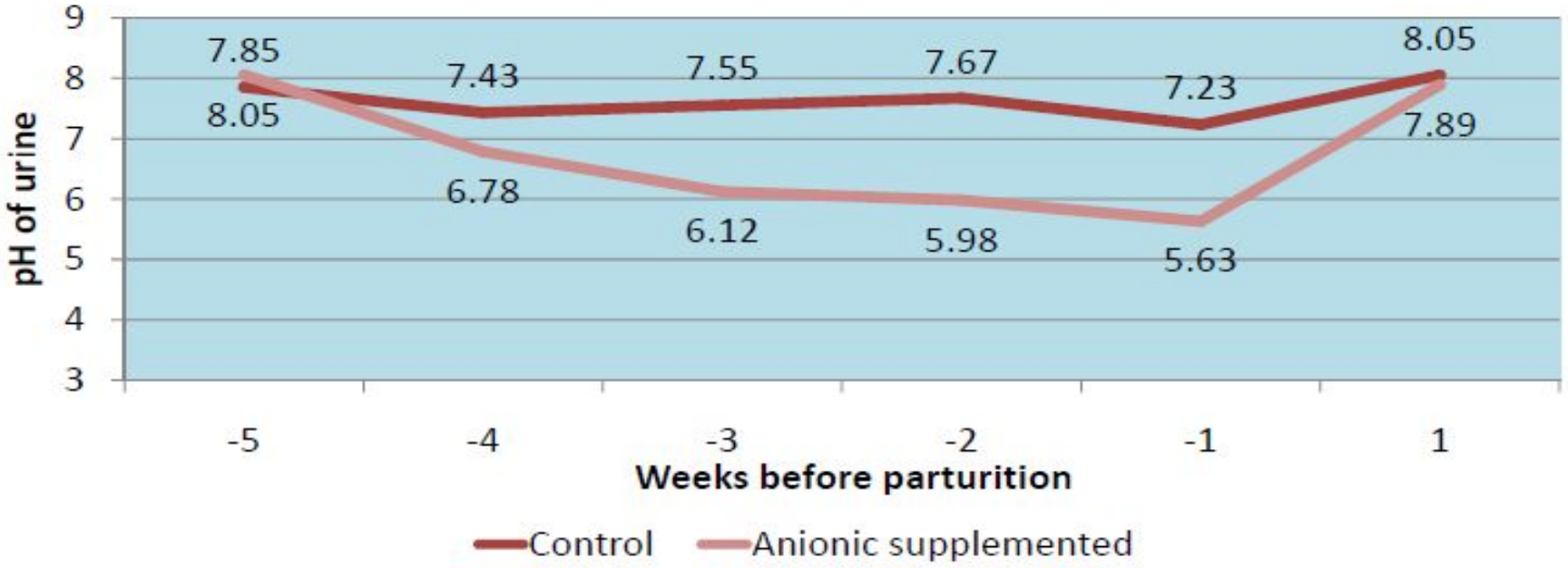
[a, b] Means with different superscript in a row differ significantly ($P<0.05$)
[c, d] Means with different superscript in a row differ significantly ($P<0.01$)

Effect of feeding a balanced ration on antibody titre against FMD vaccination

Parameter	Antibody titre (n=70)	
	Traditional feeding with FMD vaccination	Balanced feeding with FMD vaccination
FMD type-O	1.80^{a} ±0.11	2.31^{b} ±0.09
FMD type-A	1.62^{a} ±0.13	2.14^{b} ±0.10
FMD type-Asia1	1.99^{a} ±0.14	2.62^{b} ±0.21
a,b means with different superscript in a row differ significantly (P<0.05)		

Effect of supplementing anionic salts on milk fever

- DCAD of -10 to -15 meq/100 g DM is effective in preventing milk fever.
- 150 animals were supplemented with anionic salts prior to calving, resulted into lower pH, which activated hormones responsible for Ca homeostasis.



Blood serum calcium, phosphorus & magnesium levels were 6.8 to 8.6, 3.2 to 5.5 & 2.5 to 3.5 mg/dl, respectively & no signs of milk fever were observed upto 3 months in experimental animals.

Sub-Acute Ruminal Acidosis (SARA)

- SARA is a disorder of ruminal fermentation, characterized by extended periods of ruminal pH below 5.5-5.6.
- For optimum ruminal fermentation & fibre digestion, ruminal pH should lie between 6.0 & 6.4.
- Ruminal pH in normal physiological range was maintained by supplementing $NaHCO_3$: MgO in 3:1 buffers.
- This led to increase in milk fat & SNF content of milk.

Healthy rumen papillae

Severe damage to rumen papillae

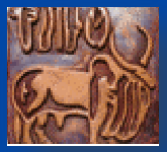
Ketosis

- Ketosis commonly results from a severe negative energy balance during the early lactation.
- The mobilisation of large amounts of body fat in the liver in an attempt to bridge this shortfall can lead to toxic levels of ketones accumulating in the blood, milk and urine. This results in loss of appetite and a marked fall in milk yield.

Incidences of ketosis were reduced by 90% on supplementation of 100-150 g propylene glycol orally for 5 days & 150-200 g bypass fat.

Effect of balanced feeding on first post-partum estrus (PPE) in buffaloes

Parameter	Post-partum ovarian activity	
	Traditional feeding (n=900)	Balanced feeding (n=900)
PPE in 45 days (no.)	160	480
PPE in 60 days (no.)	320	340
PPE in 120 days (no.)	600	840
Anoestrus after 120 days (no.)	300	60
% animals conceived up to 120 days	67	93



Effect of balanced feeding on enteric methane

Species		MY (kg/d)	Fat (%)	CH_4 emission (g/kg MY)	Reduction (%)
Western region					
Cows (*n*=30)	Before	11.9[a]	4.1	19.3[a]	15.5
	After	12.4[b]	4.3	16.3[b]	
Buffaloes (*n*=22)	Before	8.5	6.5[a]	27.3[a]	17.9
	After	8.9	6.8[b]	22.4[b]	
Northern region					
Cows (*n*=20)	Before	6.5[a]	4.2	32.8[c]	19.8
	After	7.2[b]	4.3	26.3[d]	
Buffaloes (*n*=34)	Before	6.5[a]	6.5[a]	36.9[a]	17.6
	After	7.0[b]	7.0[b]	30.4[b]	
Southern region					
Cows (*n*=30)	Before	8.4	4.1	22.2[a]	15.3
	After	8.8	4.1	18.8[b]	
Central region					
Buffaloes (*n*=26)	Before	6.1[a]	6.5[a]	25.3[c]	19.4
	After	6.6[b]	6.8[b]	20.4[d]	

[a, b] ($P<0.05$); [c, d] ($P<0.01$)

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Summary

Improvement in milk production efficiency in an environmentally sustainable manner can be achieved by minimizing the metabolic & reproductive disorders through balanced feeding.


Thanks