DRINKING WATER QUALITY & BROILER PERFORMANCE

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- Water is 70% of Chicken body and is consumed in greater quantity than any other nutrient by birds.
- A single day without water results zero body weight gain.
- Water is a major component of blood and plays main role in transporting nutrients & oxygen to the cells and carrying waste away.
- Water is directly related with all physiological activities like Digestion, Respiration, Excretion, Production, Thermo-regulation, Movement etc.
- Modern broiler becomes very efficient in its growth and feed conversion but also become less & less tolerant to stress; with a significant stress from poor water quality.

Figure 1

- What might have had no impact on birds 15 years ago, could be devastating for the bird of today. Birds may die rapidly from lack of water than due to lack of any other nutrients.
- The body requirement of water varies with the age, health, climate and feed type
- In poultry production water is needed for the life of birds, to reduce air Temperature (Climate control system), and to Wash, clean & sanitize farm.

Ambient Temperature	Feed vs Water Intake in Broiler
4°C / 39°F	1 : 1.7
20°C / 68°F	1 : 2
26°C / 79°F	1 : 2.5
30°C / 86°F	1 : 3
37°C / 99°F	1 : 5

WATER QUALITY PARAMETER

- ***Physical Appearance: Turbidity, Colour & Odour***
- ***Contamination: Chemical & Microbial***
- ***Hardness***
- ***TDS***
- ***pH***

Figure 2

DRINKING WATER DEPRIVATION in BROILER RESULTS

Reduced Feed Intake, Low Body Weight & High FCR

Dehydration & Immuno-suppression.

Failure to maintain body Temp with increased heart size followed by multi organ failure & death.

Chemical Imbalance: All body processes get disturbed with dehydration from joints to brain function because blood become concentrated.

Impaired Intestinal Villi height & texture, affecting digestion resulting low Body Weight with elevated FCR.

PHYSICAL MANAGEMENT OF WATER AT FARM:

- Drinking Water must be Clear, Colourless & Odourless
- Water source shall be Tube-Well or Bore-Well
- Water Tank: 1 outside main Tank and 1 small tank inside every shed
- All Tank must be cleaned & sanitize after Lifting of Birds
- Inside Tank shall be refilled after every 8 hrs for broiler.

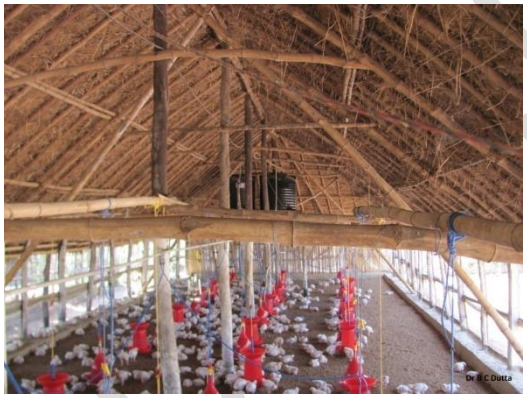

Figure 4

Figure 3

Water Temperature	Water Intake
> 5°C (41°F)	Too cold, birds consume less water
10-14°C (50-57°F)	Ideal
> 30°C (86°F)	Too warm, birds consume less water
44°C (111°F)	Birds refuse to Drink

MANAGEMENT OF WATER CONTAMINATION AT FARM:

- Drinking Water must be Free from any Contamination of Chemical & Bacterial origin
- Broiler performance affected by as little as 10 ppm Nitrates; mostly indicate sewage or fertilizer contamination
- Use of Water SANITIZER from Day 1 till Lifting, even on the day of Vaccination (All Broiler Vaccinations are against Viral infections; Sanitizer has nothing to with Vaccination)

Few Good Water Sanitizers are:
a) Chlorine Salt (Tablet)

b) Iodine Salt – *best in current situation which is effective against Fungus & some Viruses*

c) Didecyl dimethyl ammonium Chloride (DDAC)

- Compulsory Laboratory Test of Water after every flock.

HARDNESS OF WATER

- The Water hardness is the amount of dissolved calcium and magnesium in the water. Hard water is high in dissolved minerals, both Ca & Mg.

Scale buildup in a pipe, caused by hard water. Credit: Dept. of Energy.

Table 1

Water Hardness Scale		
Grains/Gal	**mg/L & ppm**	**Classification**
Less than 1	Less than 17.1	**Soft**
1 – 3.5	17.1 - 60	**Slightly Hard**
3.5 - 7	60 - 120	**Moderately Hard**
7 - 10	120 - 180	**Hard**
Over 10	Over 180	**Very Hard**

- Hardness of water is not a major health concern, but it can cause mineral build up in water pipeline.

TDS OF WATER

- TDS is Total Dissolved Solid in water; inorganic like Calcium, Magnesium, Sodium, Potassium, Bicarbonates, Chlorides & Sulphates and organic matters.
- TDS in drinking-water originate from natural sources, sewage, urban run-off, industrial wastewater and chemicals used in the water treatment process, and the nature of the piping used to convey the water, i.e. the plumbing
- TDS concentration is the sum of the cations (+vely charged) and anions (-vely charged) ions in the water
- High TDS in water is not a health hazard but results Poor water intake & corrosiveness

Cations combined with Carbonates CaCO3, MgCO3 etc	**Associated with hardness, scale formation, bitter taste**
Cations combined with Chloride NaCl, KCl	**Salty or brackish taste, increase corrosivity**

- The treatment options for an elevated TDS depends on the nature of the cations and anions. If the elevated TDS are due to Ca, Mg and Fe; water softener may be used which may not reduce the TDS concentration, but reduce the aesthetic problems with the water. If the problem elevated TDS is due to Na, chloride, or K, the recommendations would be reverse osmosis system or distillation. If the problem is related to Iron, Manganese, Arsenic, or total hardness, Filtration systems is the answer.

WATER pH

- pH is measured on scale of 1.0 to 14.0 with 7.0 is neutral; below 7.0 indicates Acidic while above 7.0 is Alkaline.
- pH above 8.0 may impact taste by causing bitterness, thus reducing water consumption and effects Digestion
- pH impacts water quality; alkaline pH favors the growth of pathogens.
- High water pH can be reduced by using Water Acidifier; a combination of organic acids.

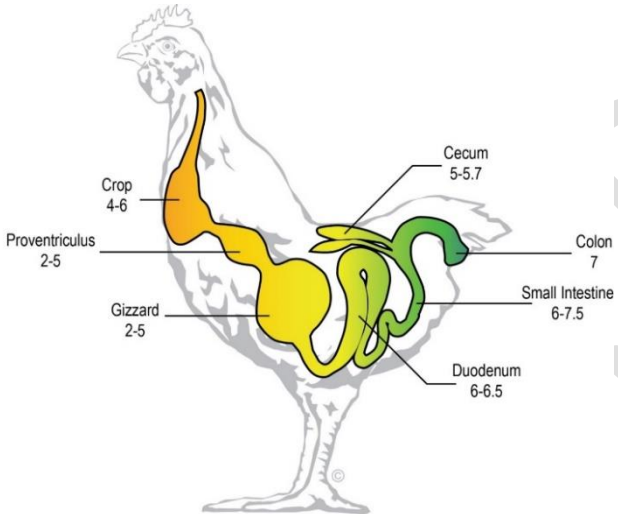

Figure 5

Poultry Intestine & Drinking Water pH

- Poultry Intestinal tract pH is acidic till the last part of Rectum.
- But Drinking Water pH in most part of India is Alkaline
- In open Broiler farming litter material continuously gets into Drinker resulting further increase of pH
- Alkaline pH favors Bacterial growth in Intestine
- Alkaline pH affects digestion & absorption of Nutrients resulting Poor Body Weight.

To Maintain the Normal Atmosphere of Gastro-Intestinal Tract ACIDIFIER need to be added in Feed & Water continuously.

- Keeping drinking Water pH near 6 helps preventing & controlling many bacterial diseases like E coli, Salmonella, Staphylococcus, Clostridium which are continuous threat to Intestine.
- Water acidification helps establishment of intestinal microflora in early life of birds and during each feed change when nutrient shift can cause instability in intestinal microflora ecology
- Keeping pH between 5 to 6 during whole production cycle of broiler helps establishment & maintenance of healthy intestinal microflora which improves performance & ensure profitability
- Lower pH Improves the availability of Chlorine and thus makes Chlorine Sanitizer successful
- Improves the utilization Oral Antibiotics
- Prevents the build-up of Lime Scale in Waterlines

Figure 6

Drinking Water quality especially, pH is the 5th parameter after Genetics, Nutrition, Husbandry & Biosecurity in Broiler in order to obtain Full Expression of Genetic Potential.