

Total Gut Integrity in Poultry and Synergistic Role of Herbs



Total gut integrity (TGI) can be defined as “the maintenance of intestinal health to enable the expression of the full genetic potential for growth and yield and to fully utilise the dietary nutrients”. Or in simple words, TGI simply means an “unimpaired and sound intestine”. A sound gut is a must for the best production performance of a poultry bird. The better the digestive performance, the better will be the productivity and profitability of the farm. In recent years, the problems associated with total gut integrity (TGI) have been the major reason behind huge losses to the poultry industry. A number of factors can be responsible for the impaired gut of a bird, which can be summarised in brief as:

- **Immuno-suppression:** Viral diseases such as Gumboro disease will affect the bursa of Fabricius and ultimately lead to a suppressed immune system.
- **Concurrent intestinal disease:** e.g. some infectious bronchitis (IB) variants have gut replication phases.
- **Antimicrobial activity:** Use of a product which has an effect on bacteria can affect the natural micro-flora of the intestine and disturb the normal gut functions.
- **Feed factors:** The role of the nutritional balance is critical in formulating the diets.
- Infective agents, toxins, chemicals, etc., will lead to inflammation, damage to absorptive epithelial cells, shortening of villi, etc., which will further lead to reduced absorption of nutrients.

Loss of Intestinal Integrity

The loss of intestinal integrity can be visualised by an increase in one, or more, of many undesirable factors, such as:

1. Excessive production of mucus

Mucus is produced by specialised epithelial cells and goblet cells in the poultry gut, in response to irritation. It is a normal mechanism seen in the gut as an attempt to control infection. Unfortunately, mucus can aid the proliferation of some harmful organisms like *Clostridium perfringens* that utilises it as a source of food. This may lead to the conditions of necrotic enteritis and other gastrointestinal disturbances in the birds.

2. Excessive watery contents

The excessive secretion of water from the gastrointestinal tract as a result of an osmotic effect of the diet due to feed formulations, infection, toxins, poor quality feed ingredients or incorrect electrolyte balances in the feed, etc., indicate a loss of total gut integrity.

3. Inflammation of the gut lining

Inflammation is a normal response to an irritation. The body's blood supply to the affected area increases in an attempt to deliver immune cells and antibodies to fight any

infection. This may also result in excessive secretion of fluids into the intestine.

Consequences of loss of TGI

- Dehydration
- Diarrhoea
- Depression
- Weakness
- Reduced appetite
- Huddling
- Emaciation
- Feed refusal

Phytogenics:

A number of medicinal herbs are scientifically validated for their activity as digestive stimulant and gut function modulators, to maintain the integrity of the gut linings. The major medicinal herbs involved are *Plantago ovata*, *Acacia catechu*, *Aegle marmelos*, *Punica garantum*, *Berberis aristata*, *Holarrhena antidysenterica*, etc., with a number of active constituents performing a number of functions in a synergistic way to enhance the total gut integrity. Some of the important medicinal herbs having a role to maintain the gut integrity are discussed in brief:

Plantago ovata:

Plantago ovata is commonly known as blond psyllium or ispaghula. *Plantago ovata* is native to parts of Western Asia, Pakistan, China, Russia and India. The muco-polysaccharide that the herb contains is not absorbed by the digestive system and helps in proper faecal discharge from the body, as well as also being used to soften and improve the movement of the bowel. It is somewhat resistant to fermentation and is passed largely unchanged through the gastrointestinal tract. It is a popular remedy for relieving the problem of constipation and gut-associated disorders.

Acacia catechu:

Acacia catechu is also commonly known as catch tree or black catechu. The *Acacia catechu* tree is found all throughout India. The main areas for its habitat in the country are the eastern slopes of the Western Ghats and the Himalayan tracts. The *Acacia catechu* plant contains tannins and flavonoids in a significant amount. It has an astringent as well as hepato-protective action.

Aegle marmelos:

Aegle marmelos is a herb which is commonly known as apple wood or bel. It has an effective digestive, astringent and stomachic property. It also relieves chronic dysentery and diarrhoea, as well as checking bacillary dysentery and assisting in providing relief from the ulcerated mucosa of intestinal epithelium.

Punica granatum:

Punica granatum is native to a region from Iran to northern India and is commonly known as pomegranate. The major phytochemicals in pomegranate are polyphenols, including the hydrolysable tannins called ellagitannins. It has a very vital role to play in maintaining the gut functions of the birds.

Berberis aristata:

Berberis aristata is also known as Indian barberry or tree turmeric. It is found in the temperate and sub-tropical regions of Asia, Europe, and America. It is native to the Himalayas in India and in Nepal. The plant contains berberine which has antibacterial, antifungal, antiviral and antioxidant properties. As most of the times, the infections of the gut may be of bacterial origin so it helps through its antibacterial activity to counter these infections. The antioxidant activity helps to improve the production performance of the birds.

Holarthena antidysenterica:

It is found all over India and other Asian countries up to an altitude of 1300 m, especially in the sub-Himalayan tract, in deciduous forests and open wastelands. It has antidysenteric, astringent and spasmolytic activity. These actions help the bird to counter the gut affections effectively. It also has immuno-modulatory activity which helps in strengthening the immune system of the birds.

Scientific Validations:

A scientific trial was done (in Greece) to investigate the potential protective use of a phytogetic polyherbal preparation in the diet of broiler chickens and its effect on growth, performance, gut health, gut microbiota, digestibility, immunity and antioxidant status of the chicken.

A total of 640 day-old Ross-308 male chicks were studied.

They were separated into five equal groups with eight replicates (n=16).

Dose @ 500g/tonne of feed

Experimental period : 0-42 days.

Body weight and feed intake were recorded (on days 7, 14, 21, 28, 35 and 42 of age), and feed conversion ratios were calculated.

Parameter	Control	Treatment
Mean body weight gain (g)	2429.50	2491.30
Feed intake (g)	4312.40	4295.00
FCR	1.78	1.72
<i>Clostridium perfringens</i> (x 10 ⁵)	83	26
<i>Lactobacillus sp.</i> (x10 ⁵)	16	51
Villous height (µm)	1357	1545
Crypt depth (µm)	138	144
Villous height to crypt depth ratio (µm)	9.8	10.7
Ether extract digestibility (%)	82.9	91.2
Total phenolic content (mg GAE/gm)	1.91	34.18
Antibody titre	1.98	2.05

The results of the study indicated that supplementation of the phytogetic polyherbal preparation revealed significant benefits in terms of:

- preventing incidence of diarrhoea/ enteritis
- reducing gut microbial load

- modulating gut microflora
- improving gut morphometry
- Improving gut immunity & thereby preventing the birds from infections
- Supplementation of herbal preparation didn't exert any detrimental effect on meat quality & palatability rather found to improve aroma and juiciness.

Conclusion:

The role of herbs in maintaining the total gut integrity is very crucial, and the traditional knowledge of the herbs after going through the modern research has approved their usage to a greater extent. All these herbs, along with several others, have their specific roles to play in maintaining the digestive system of poultry birds. Their usage not only prevents the dangers of food safety which occur as a result of increased usage of antibiotics and other chemicals, but also enhances the overall performance and profitability of the farm.



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