

Anti-Nutritional factor

Introduction

- Anti-Nutritional factors are those one generated from natural plant feeds stuffs exerting inimical i.e. adverse effect.
- It is also a naturally occurring substances in plant materials and greatly influences a metabolic path way.
- Most of the ANF's are heat labile.
- The effects are inhibition of growth, decrease in food conversion efficiency, pancreatic hypertrophy, liver damage and other pathological damages.

Classification of Anti-Nutritional factors

- Based on nutrients affected and biological response produced in fish, the toxic factors classified as follows:
 1. Substances depressing digestion (or) metabolic utilization are protease inhibitors, lectins (Haemagglutinins), saponins, polyphenolic compounds (Tannins)
 2. Substances reducing the solubility of nutrients are phytic acids, oxalic acids, glucosinolates, gossypols

3. Substances which inactivating vitamins and hormones (Antivitamin A, D, E, K and pyridoxine)
4. Mimosine
5. Cyanogens
6. Moulds and toxins
7. Bacterial infection (salmonella contamination and mycobacteriosis)
8. Bacterial toxins (Botulism)
9. Chemical contaminants - pesticides, herbicides, heavy metals, volatile N- nitrosamines
10. Peroxides

Protease Inhibitors

- Most well known is Trypsin Inhibitors.
- Trypsin inhibitor occurring in raw legume seeds, particularly soybean.
- Trypsin inhibitors were first described in soybean, but are also known to be present in groundnut and most other leguminous seeds.
- The degree of deactivation of the toxin depends upon the applied temperature, duration of heating, particle size and moisture conditions.

- Soyabean trypsin inhibitors are totally deactivated by moist heat at 100°C for 15-20 minutes.
- Overnight soaking or germination of beans, while bringing about improvement in their nutritive value, does not destroy the trypsin inhibitors.

Lectins (Haemagglutinins)

- Haemagglutinins, or lectins, are proteins that possess a specific affinity for sugar molecules. As the name implies, they cause agglutination of red blood cells.
- These toxins, which cause red blood cells to agglutinate, are present in almost all legume seeds.
- The potency of the toxin, however, varies from species to species, with those of *Phaseolus vulgaris* among the most potent.

- Phyto-haemagglutinins are also heat labile, but care should be taken to ensure that adequate heat is applied.
- It is found in seeds of higher plants, tubers (rice, wheat, potato, ground nut oil cake, kidney bean).
- Lectins reduces absorption of nutrients in the gut and cause internal hemorrhages and growth.
- It is heat labile; cooking or autoclaving is the method used to remove this substance.

Saponins

- These significant characteristics is exhibited by saponins. They are, bitter taste, forming in aqueous solution, haemolysis of RBC.
- Effects – excess salivation, increased respiration – haemolysis, damage to liver and kidney
- Examples are soyabean, mung bean, jack bean, alfaalfa.
- Soaking in water for 24 hrs will eliminate this substance

Tannins

- It is a polyphenolic compounds and same effects as saponins
- Soaking and cooking is the method to remove this substances.
- It is found in sorghum, mustard seed and rape seed.

Phytic Acid (Phytates)

- Plant which are rich in proteins and also rich phytates.
- Phytates are salts of phytic acid. It occurs in plants.
- Phytates form complexes with transitional nutritional elements (Zn, Fe, Mn) and make insoluble in intestinal tract.
- Addition of phytase enzyme externally in the feed may counter act the toxic effect. Eg. Soyabean, sesame, rape seed meal

Oxalic Acid (Oxalate)

- Both in plants and animals, oxalic acid (oxalates) found in free and salt forms.
- Eg. Beet, spinach etc.
- Water soaking in 24 hrs will reduce the oxalic acid content

Glucosinolates

- It is responsible for pungent flavour found in family cruciferae i.e. *Brassica* sp, which include mustard seed, rape seed and cabbage
- It depresses the thyroid hormone
- Soaking in water or cooking will reduce this content