

Feed Additives

Introduction

- A variety of substances are added in aquaculture feeds to protect the labile nutrients, to improve nutrients availability and utilization by the cultured animals
- Binders, antioxidants, mould inhibitors, antimicrobial agents, attractants, growth promoters, medicants, pigments etc are often included.
- The substance selected and used should not have any harmful effect to the cultured animal or to the consumers, should not react with the feed ingredients and alter the nutritional quality of the feed negatively, and should not reduce the desirable qualities of the meat produced by way of affecting its taste, appearance, flavour and texture.
- The substance should be available in sufficient quantities a reasonable cost.

Binders

- Binders are essential to provide the desired water stability to the feeds, to prevent disintegration of feeds and leaching of nutrients into the water.
- The selection and inclusion levels of a binder are dependent on the binding capacity and cost.
- Gelatinised starch from tapioca, wheat flour and rice flour are quite adequate in most feeds.

- Recommended levels of binders guar gum, gum-acacia, are 1-2%; gelatin, collagen, alginates, carrageenan and agar 2-5%; and wheat gluten (10-12%) and starch from wheat flour and tapioca could be used in relatively high levels (up to 30%).
- A mixture of some of these binders may be more effective and economical to use. Carrageenan and chitosan can be used in larval feeds also.

Antioxidants

- Antioxidants are essential to protect the fatty acids, and other oxidizable components in the feeds.
- They can be added to lipids or the vitamin premix during manufacture of feeds.
- Lipids containing polyunsaturated fatty acids on exposure to air, light, heat and moisture, are highly prone to oxidation.
- The oxidation products may combine with vitamins and amino acids and reduce their bioavailability in feeds.

- Marine lipids (fish oil) and oil-rich fish meals should be specially protected from oxidation by adding antioxidants.
- The factors which accelerate lipid oxidation in feed ingredients and finished feeds are peroxides, ultra violet light, high temperature, and trace metals notably copper, iron, cobalt and zinc.
- The most commonly used antioxidants in feeds are (i) ethoxyquin 0.015%, (ii) butylated hydroxyanisole 0.2%, (iii) butylated hydroxy toluene 0.2%. Natural antioxidants which go as components of feed include ascorbic acid and vitamin E.

Antimicrobial agents

- Feed ingredients and formulated diets, being highly nutritive, under unfavourable conditions of storage, are susceptible for the growth of microorganisms - bacteria, yeast and fungi.
- The biggest problem is with fungi which grow rapidly at moisture content exceeding 13%, relative humidity of 70 to 90 % and temperature 25°C
- *Aspergillus spp*, *Fusarium spp.*, and *Penicillium spp.* are associated with this spoilage and cause extensive damage to feeds and ingredients.

- They alter the nutritional status, cause bad flavour and taste, staleness, and produce highly toxic and carcinogenic mycotoxins (aflatoxins, trichothecenes, ochratoxin and zearalenone, T-2 toxin etc.).
- Thus fungi infestation of feeds affects the shelf-life and results in substantial economic loss. Preservatives are useful in controlling fungi .
- The most widely used preservatives are sodium and calcium propionates at levels ranging from 0.1 - 0.25%. Sorbic acid, potassium sorbate, sodium sorbate, propionic acid, calcium sorbate, menadione, sodium benzoate etc, can also be used as preservatives.

- In aquaculture systems, the cultured animals are predisposed to pathogenic infection.
- In order to achieve maximum production and feed efficiency these infections should be prevented or controlled.
- Certain broad spectrum antibiotics are used in medicated feeds to control such out-breaks of diseases. Some of these are oxolinic acid, oxytetracycline, terramycin etc.