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Use of Seaweed in Livestock Feeding

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***Abstract*:** Since ancient times, animals in coastal areas have traditionally been fed seaweed, also referred to as marine algae. Seaweeds have been fed to cattle for a very long time. Seaweeds are blended with animal feed since they might be harmful to animals if taken alone. Seaweeds have a wide variety of forms, sizes, colors and compositions. Seaweed contains 5-10 times more minerals than land plants. seaweeds are considered to be a natural source of additives that can replace the use of antibiotics in a variety of animals because they are very rich in beneficial metabolites and minerals.

Key words: Animal nutrition, Feed additive, Seaweeds

Introduction:

Seaweed species are usually used as a raw material in medicine, food for humans and animals, and as chemical fertilizers to improve agricultural land. Seaweeds are very good alternative source for livestock because of they are rich in dietary fibre, protein, lipids and minerals. They are rich source of calcium, phosphorus, magnesium, iron, copper, zinc, cobalt, sodium, potassium selenium and iodine. They also rich source of vitamin A, D, E, B_1, B_{12}, B_2, B_3, B_5 and folic acid (Corino *et al.*, 2019). Lipid content of seaweed is low about 1-5% with the majority of the lipids being polyunsaturated n-3 and n-6 fatty acids. Most common edible seaweed species that show health benefits are *Palmaria palmata*, *Undaria pinnatifida*, *Saccharina latissimi* and *Chondrus crispus*. Chemical composition of seaweed had wide variety that depends on habitat, species, time of collection and external conditions such as temperature, light and water. Most commonly used seaweeds are brown, green and red. Now a days seaweed became good alternative source to use of antibiotics in animal diet (Probst *et al.*, 2015).

Nutritional Profile:

Green seaweeds (*Chlorophyta*), of which 2200 species are known, can grow to a height of 1 m. Their colour is determined by the amount of chlorophyll present. With about 6100 species, red seaweeds (*Rhodophyta*) are adept at photosynthesizing in deeper seas. Their length varies, and they resemble green seaweed. Their colour is caused by the presence of pigments called phycoerythrin and phycocyanin, which cover carotene, lutein, zeaxanthin and chlorophyll. There are over 1800 species of brown seaweeds (*Ochrophyta* and *Phaeophyceae*), of which only 1% are known to live in freshwater. They can grow up to 50 metres in length. The amount of pigment fucoxanthin in them is what gives them their brown colour. Seaweed mostly contains high levels of glutamic acid, which is available in both free and protein-bound forms and contributes to the usual umami flavour. They also include a variety of bioactive peptides and amino acids, including glutathione, carnosine and taurine (Overland *et al.*, 2019).

Table 1: Nutrient (% DM) and mineral (mg/100gDM) composition of some edible seaweeds

Nutrient composition (%)					Mineral composition (mg/100g)			
Species	Protein	Dietary Fiber	Carbohydrate	Lipid	Na	P	Ca	Mg
Green seaweed								
C. lentillifera	10-13	33	38-59	0.86-1.11	8917	1030	7800-1874	6300-1650
C. racemosa	17.8-18.4	64.9	33-41	9.8	2574	29.71	1852	3844-1610
Red seaweed								
C. crispus	11-21	10-34	55-68	1.0-3.0	1200-4270	135	420-1120	600-732
C. changii	6.9	24.7	-	3.3	5465	-	402	565
Brown seaweed								
A. esculenta	9-20	42.86	46-51	1-2	-	-	-	-
E. bicyclis	7.5	10-75	60.6	0.1	-	-	-	-

Table 2: Vitamins contents (mg/100g edible portion) of seaweeds

Vitamins (mg/100g)								
Species	A	B_1	B_2	B_3	B_5	B_6	B_8	C
Green seaweed								
U. lactuca	0.017	0.024	0.533	98	-	6	-	0.242
U. rigida	9581	0.47	0.199	0.5	1.70	0.1	0.012	9.42
Red seaweed								
P. palmata	1.59	1.56	1.91	1.89	-	8.99	-	6.34
P. umbilicalis	3.65	0.144	0.36	-	-	-	-	4.21
Brown seaweed								
S. japonica	0.48	0.2	0.85	1.58	-	0.09	-	-
S. latissimi	0.04	0.05	0.21	-	-	-	-	0.35

Pig Feed:

Poor food, high mortality rate, health-related concerns, excessive stocking numbers, and stress all contribute to inferior growth and performance in commercial pig production. Furthermore, most nations recent ban on the use of preventative antibiotics (feed additives that act as growth boosters) in pig feed has had a substantial influence on pig growth and productivity. Seaweeds and their extracts have recently been investigated as a potential substitute for feeding antibiotics to pigs. Soluble dietary fibres and indigestible polysaccharides derived from seaweeds, such as fucoidan, laminarin, ulvan, and alginate, have powerful antibacterial effects (Lynch *et al.*, 2010). The addition of seaweed to feed significantly replaces certain organic acids, antibiotics and growth stimulants (such as ractopamine), allowing the industry to maintain and improve pig production in difficult conditions at a cheaper cost.

Ruminant Feed:

Seaweed has always been the most recommended fodder for cattle in coastal areas. Seaweed bioactive chemicals not only increase animal performance and health, but they also boost milk quality by increasing its necessary fatty acid and protein content. These chemicals are deposited in the muscle tissue and improve meat quality and productivity. A supplemented meal may boost superoxide dismutase activity and antioxidant capacity in both foraging and grazing animals. This enhances the health, performance, and meat quality of the animals by assisting them in combating oxidative stress (Saker *et al.*, 2001). There was an improvement in rumen fermentation activity, feed conversion, nutrient digestibility, milk yield and composition and blood serum proteins.

Poultry Feed:

Studies have shown that adding seaweed to poultry diets can be a beneficial feed substitute. In addition to serving as an effective pellet binder, seaweed can substitute up to 10-15% of the ingredients in chicken diets. Up to a 2-3% inclusion level of seaweed in feed could improve feed pellet hardness while having no negative effects on egg production, quality attributes or broiler performance. Without sacrificing flavour or quality, it can raise the amount of omega-3 fatty acids in eggs, lutein and zeaxanthin in meat and egg yolks (Carrillo *et al.*, 2012).

Conclusion:

Seaweeds are on the verge of becoming popular due to their appropriateness as possible feedstock production as well as food supplements. Seaweeds are high in phytochemicals, dietary fibres, and protein that is utilised to improve the nutritional value of animal feed. The beneficial effects of seaweed are often less than 10% of the overall concentration in animal feed. Seaweeds enhance the growth and performance to young livestock. They also increase the milk yield,

digestibility of nutrients, egg production and quality of egg yolk and albumin.

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