USE OF APPLE BY-PRODUCTS IN POULTRY RATIONS OF BROILER CHICKS IN KARACHI

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Background: In Pakistan and all over the world white meat consumption has increased during the last few decades. The cost of poultry feed and fish is quite high. To over come this problem a lot of research work has been done to replace high cost feed ingredients with low cost fruit by-products. This study has been carried out on the inclusion of apple by-products in poultry feed. **Methods:** One Hundred one day old broiler chicks purchased from the local breeders were reared in the poultry farm of the Physiology department of University of Karachi. They were divided into two groups A and B. The feed of group A contained maize in addition to other ingredients, whereas the feed of group B substituted maize with apple by-products. Feed consumed, water intake, weight gained, Feed Conversion Ration (FCR) and mortality was recorded daily. Both the groups were also vaccinated with only ND and IBD. The performance of broilers on this feed was monitored and compared between conventional feed and apple by-products mixed feed. **Results:** Both the groups of birds gained appropriate weight required to be marketed at the end of 6 weeks. Group B compared to Group A gained more live weight. Although there was a difference of 320 gm between live weight of the two groups. Statistical analysis shows this difference to be non-significant. **Conclusion:** We conclude that apple by-products are a cost effective yet equally good feed adjunct for broiler chicks.

Keywords: Apple by-products, broiler chicks, growth, cost effective.

INTRODUCTION

Most developing countries are facing difficulties in providing sufficient food for their population. The cost of feed is very high and in recent years the price of conventional or basic feeding ingredients has tremendously increased. This has made poultry/live stock production very expensive. It is the need of the time to utilize unconventional feeds like agro industrial by-products to make a balanced feed especially for poultry production efficiently.

In Pakistan, India and other Asian countries apple, banana and mango are fruits which are produced in great numbers.[1] Meredith[2] described that in apple producing areas millions of tones of apple are produced yearly, out of which 30–40% get damage and are therefore not marketed and left in the orchids till they get rotten and decomposed. Depending on the apple juice requirement of the various countries 20–40% of apple is processed in factories and thousand of tons of pumace (residual material from apple after juice extraction) is wasted without any alternative use. Both apple and its by-products have nutritional potential for animal feeding.[3,4]

Fresh apple are considered a food of moderate energy value, whereas processed apply by-products are either comparable to fresh apple in energy value or higher because of concentration, dehydration, or the addition of sugars during processing. Chemical composition of apple is affected by many factors, including cultivator, growing region, climate, cultural practices, and processing. The approximate composition of apple and apple products are given in tables 1-5.[5]

Table 1: Approximate Composition of Apples and Apple Products

Product	Water (%)	Energy kCal/100 g	Protein (%)	Lipid (%)	CHO (%)	Fiber (%)	Ash (%)
Fresh apple with skin	83.9	59	0.19	0.36	15.3	0.77	0.26
Apple without skin, cooked	85.5	53	0.26	0.36	13.6	0.54	0.28
Canned apples, sweetened	82.4	67	0.18	0.14	16.7	0.54	0.27
Dehydrated apples (low moisture	3.0	346	1.32	0.58	93.5	4.09	1.57
Dehydrated apples	31.8	243	0.93	0.32	65.9	2.87	1.10
Dehydrated apples sulfured and cooked without added sugar	84.1	57	0.22	0.07	15.3	0.67	0.26
Frozen apples	86.9	48	0.28	0.32	12.3	0.54	0.24
Canned apple juice	8709	47	0.06	0.11	11.7	0.21	0.22
Apple juice frozen concentrate, undiluted	57	166	0.51	0.37	41.0	–	1.12
Applesauce, unsweetened	88.4	43	0.17	0.05	11.3	0.53	0.15
Applesauce, sweetened	79.6	76	0.18	0.18	19.9	0.46	0.14

Source: Handbook of Fruit Science and Technology by D. K. Salunkhe & S. S Kadam

Table 2: Dietary Fibers Content of Apple Fruit (g/100g Dried Food)

Constituent	Golden Delicious	Granny Smith
Moisture	85.0	86.0
Insolube Noncellulosic polysaccharides	1.11	0.48
Hexoses	1.32	1.11
Pentoses	0.28	0.29
Uronic acids	2.71	1.88
Total		
Total noncellulosic polysaccharides	1.58	0.97
Hexoses	2.04	1.74
Pentoses	3.27	2.83
Uronic acids	6.89	5.54
Total		
Cellulose	2.68	4.23
Lignin	0.53	0.66
Dietry fiber excluding resistant starch	10.1	10.4

Source: Handbook of Fruit Science and Technology by D. K. Salunkhe & S. S Kadam

Table 3: Organic Acids Found in Apple Fruit

Whole fruit or juice	Peel	Pulp
Malic	Glyoxylic Isocitric	Pyruvic
Quinic	Malic	Malic
Succinic	Quinic	Quinic
Lactic	Shikimic	Shikicmic
Glucoroic	Glyceric	Citramalic
Citramalic	Alpha-Oxoglutaric	Glyceric
Mucic	Pyruvic	Alpha-Oxoglutaric

Source: Handbook of Fruit Science and Technology by D. K. Salunkhe & S. S Kadam

Table 4 Minerals Element in Fresh Apple

Mineral	(ppm)	Mineral	(ppm)
Calcium	7.0	Chloride	4.2 – 6.2
Iron	1.8	Chromium	0.03
Magnesium	50.0	Cobalt	0.10
Phosphorus	70.0	Copper	0.45
Potassium	1150.0	Iodine	0.02
Zinc	0.4	Molybdenum	0.30
Copper	0.4	Selenium	0.9 – 1.6
Manganese	0.4	Sodium	8.9 – 9.2

Source: Handbook of Fruit Science and Technology by D. K. Salunkhe & S. S Kadam

Table 5 Vitamin content of Fresh Apples per 100 g of Tissue

Vitamin	Concentration
Ascorbic acid (mg)	5.7
Thiamin (mg)	0.017
Riboflavin (mg)	0.014
Niacin (mg)	0.077
Pantothenic acid (mg)	0.061
Vitamin B6 (mg)	0.048
Folacin (mcg)	2.8
Vitamin A (retinol equivalent)	5.3

Source: Handbook of Fruit Science and Technology by D. K. Salunkhe & S. S Kadam

MATERIAL AND METHODS

One Hundred one day old broiler chicks were purchased from the local breeders and reared in the poultry farm of the Physiology department of University of Karachi. Birds were electric brooded at 32 C for first three weeks and then reared on ambient temperature. They were divided into two groups A and B. The feed of group A contained maize in addition to other ingredients, whereas the feed of group B substituted maize with apple by-products. Feed consumed, water intake, weight gained, Feed Conversion Ration (FCR) and mortality was recorded daily. Both the groups were also vaccinated with only ND and IBD.

Table – 6 Sources of nutrients in ration of Group A & B

Nutrients Group A	Nutrients Group B
Rice	Rice
Wheat	Wheat
Maize	**Apple by -products**
Sunflower meal	Sunflower meal
Guar	Guar
Rapeseed meal	Rapeseed meal
Cotton Seed meal	Cotton Seed meal
Fish meal	Fish meal
Soya bean meal	Soya bean meal
Rice polish	Rice polish
Limestone	Limestone
Feed premix	Feed premix
Dl methionine	Dl methionine

Table – 7 Vaccination Programme

Day	Vaccine
5th	ND
12th	IBD

RESULTS

Both the groups of birds gained appropriate weight required to be marketed at the end of 6 weeks. Live weight and carcass weight were also recorded at this point. There was significant difference between these two parameters. Group B compared to Group A gained more live weight as shown in fig-1. Although there is a difference of 320 gm between live weight of the two groups. Statistical analysis shows this difference to be non-significant.

Table-8: Growth Performance of Group A

Week	Feed Intake (gms)	Cumulative feed intake (gms)	Average body weight (gms)	Feed conversion ration (gms)
1	115	115	315.6	1.35
2	209	324	630	1.80
3	278	602	692	2.04
4	418	1020	1260	2.01
5	560	1580	1437	2.22
6	622	2202	1891	2.18

Table-9: Growth Performance of Group B

Week	Feed Intake (gms)	Cumulative feed intake (gms)	Average body weight (gms)	Feed conversion ration (FCR) (gms)
1	100	100	368.4	1.43
2	175	275	672	172
3	250	525	436.1	1.91
4	390	915	1437.9	1.87
5	485	1400	1636	2.03
6	590	1990	2211	2.24

Table-10: Water consumption of Group A & B

Week	Water consumption (Litre)	
	Group A	Group B
1	1.15	2.3
2	6.0	10.6
3	10.5	14.4
4	20.5	25.5
5	22	38.5
6	30	44.2

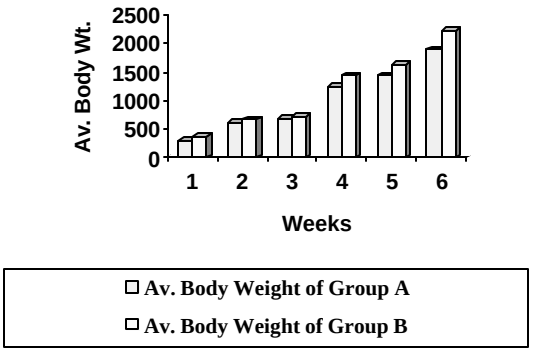

Figure-1: Comparison of growth Performances of Group A & B

DISCUSSION

Apple Pomace has to be dried to remove the moisture content and improve its quality; it is then used in poultry ration. It has been concluded that Pomace can be used safely as energy source in broiler ration replacing maize by 10% (W/W) without any side effects on the broiler production. A higher level than 10% creates a problem of wet litter and depressed feed efficiency perhaps due to higher fiber content. The Pomace can safely replace maize in a ration supplemented with multi enzymes. Broiler rations are fed as complete mixed feeds and never as separate grain and protein supplement, as rations for laying hens might be. Provided 350 inches (8.9 m) of feeder space and 75 linear inches (1.9 m) of water space per 100 birds from six weeks to market age. Broilers are full fed at all times to obtain the fastest possible gains. Vitamins and trace minerals are included in rations in small amounts. Broiler rations must be mixed properly and the quality carefully controlled. The fruit growth pattern follows a smooth sigmo idal curve. Goffinet[6] studied the fruit growth pattern of Delicious apples from bloom to October harvest. Nutritional composition of apple by-products exhibits a level of crude protein i.e. 7.6 and total carbohydrates 90.50 (on dry matter basis). Both carbohydrates and protein very important for a balance rations. In addition to this ME (k/Cal/kg) of apple Pomace is 2600 – 2750. Matoo et al[7] have reported better performance of broilers fed on apple Pomace diets supplemented with enzymes. Similarly apple and mango peels can be used safely. Dried banana flaks contain only 3 % of water hence many of the nutrients are more concentrated. Each gm of banana flaks contain 340 calories of energy, 28 gm of iron and 760 IU of vitamin A, thus can also be used in broiler diets (AO Production year book 1990).[8] Research on the inclusion of processed orange peelings has also been done in broiler and layer fees. They are good source of vitamin C and folic acid (Data from Agricultural statistics 1991 USDA).[9] Thus apple by-products and other fruit by-products mentioned above can replace some costly feed ingredients. These studies are similar to the findings of Matoo et al.[7] The processed damaged apple can safely replace 20% maize in broiler without any harmful effect and thus decreasing the feed cost and increasing broiler production. These results match with the other earlier studies done by Teli 1985.[4] Inclusion of agro industrial by-products in poultry feeds will help to reduce the cost of poultry feed, which is Rs.650/ 50 Kg. Bag.

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