ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/316667141

Low Cost Feed Formulation for Rural Poultry Production

Chapter · November 2016

CITATIONS
7

READS
158,554

1 author:

Bijaya K. Swain
ICAR-Directorate of Poultry Research (ICAR-DPR) Regional Station, Bhubaneswar
143 PUBLICATIONS **1,381** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Evaluation of azolla as an alternate feed ingredient for economic production of duck meat and egg View project

Evaluation of crossbred commercial broilers under different system of rearing and feeding in Goa Condition View project

All content following this page was uploaded by Bijaya K. Swain on 04 May 2017.

The user has requested enhancement of the downloaded file.

Low Cost Feed Formulation for Rural Poultry Production

B. K. Swain
Regional Centre,
ICAR-Centre Avian Research Institute, Bhubaneswar, Odisha
E-mail: nbkswain@gmail.com

There is need to improve the scientific knowledge for utilizing low cost locally available agro-industrial by-products in poultry feed in order to reduce the feed cost. As feed constitutes 60-70 % of the total cost of production, any attempt to reduce the feed cost may lead to a significant reduction in the total cost of production. Poultry being the monogastric animal lack fibre degrading enzyme for breakdown of complex carbohydrates like cellulose, hemicellulose and lignin. Since, the complex carbohydrate is a major component of fibrous by-products like cashew apple waste, brewery waste, rice bran, wheat bran and sunflower cake etc, there is need to find ways and means for improvement in the utilization of these fibrous materials so as to incorporate these materials in the poultry feed without any adverse effect on their health and production. There is an opportunity to utilize locally available by-products for economic production of rural poultry like Vanaraja, Gramapriya etc. Hence, it was felt to evaluate these by-products for economic feeding of poultry to produce more meat and egg with less cost. Considering the demand for egg and meat in the coming years, low cost poultry rearing is a boon for marginal farmers and landless poor in the coastal ecosystem. There is ever increasing demand for conventional feed ingredients for feeding of poultry. Incorporation of these feed ingredients in poultry feed has increased the cost of production enormously. Attempts to utilize locally available cheap by-products may benefit the end users in reducing the feed cost which in turn can reduce the total cost of production of meat and egg and making them easily available at cheaper cost in rural India. The traditional sources of vitamins and proteins used in poultry rations such as fish meal, meat and bone meal, soybean meal, groundnut cake etc. are becoming expensive in developed countries. The availability of such feed ingredients is not adequate because of the spiraling cost of raw materials and ever increasing competition with the human beings for the same food items. Hence, the search for alternative feed sources has become inevitable to reduce the feed cost.

The chemical composition of agro-industrial by-products i.e. brewers' dried grain, cashew apple waste, cashew nut shell, rice kani (broken rice) and other unconventional feed ingredients like cereals (bajra and ragi), poultry hatchery waste, and legume green fodder (cow pea leaf meal) along with their use in feed formulation have been summarized here under for low cost feed formulation for the benefit of farmers and other people associated with poultry farming.

Brewers' dried grains

Brewer's dried grain is a valuable by-product of brewery which has a potential to be used as supplementary feed for livestock and poultry. It is a safe feed when it is used as fresh or properly dried form. These materials are considered to be good sources of un-degradable protein, energy and water-soluble vitamins. They have been used in feeding of both ruminant and monogastric animals (monogastrics using predominantly the dried forms). Brewer's grain

is the material that remain after grains have been fermented during the beer making process. These materials can be fed as wet brewer's grains or dried brewer's grains. Brewers' dried grain (BDG) is a by-product of barley malt, corn or rice that is treated to remove most of the readily soluble carbohydrates, protein, fibre, linoleic acid, vitamins and minerals. Some breweries dry the brewer's grain and sell it as dried brewer's grain, while others sell it as wet brewer's grain. Both types have similar feeding characteristics if the wet brewer's grain is fed shortly after it is produced. Fermented local and industrial by-products of brewing have been used as non-conventional feedstuffs in broiler rations mainly as protein and energy supplements . Brewery wastes are available in plenty from the local breweries which can be a potential feed ingredient to economize the poultry production. Brewery by-products like brewery waste grains and yeast's are worthy of consideration as potential non-conventional feeds to promote use of locally available feed ingredients. Since the brewers' dried grain is rich in fibre, addition of fibre degrading enzyme may be useful in improving its feed value.

Fresh Brewers' grains

Formulated feed with inclusion of Brewers' dried grains

Chemical Composition

Brewery waste collected from the local breweries has to be sun dried before inclusion in the poultry feed. Brewery waste when collected from the brewery contains about 75 % moisture which is a major constraint for storing and because of high moisture content it is not possible to feed poultry as it is and need complete drying without much loss of nutrients. After complete drying, the brewery waste is designated as brewers' dried grain (BDG). The nutritional content of the material may vary from plant to plant and depending upon the type of grain used (barley, wheat, corn, etc.) in the initial brewing process as well as proportions being fermented and fermentative process being used. The range values for different chemical constituents of BDG are given below in tabular form.

Chemical composition of Brewers' dried grain

Chemical Constituents	% Composition
Dry matter	90.10-93.00
Crude protein	11.00-30.89
Ether extract	7.00-11.05
Crude fibre	9.55-20.00

Chemical Constituents	% Composition
Total ash	3.09-11.04
Acid insoluble ash	1.37-1.96
Calcium	0.28-0.60
Total Phosphorous	0.43-1.00

Practical diets formulated with inclusion of BDG for different types of poultry birds are presented below in tabular form.

Practical diets for different types of poultry birds with inclusion of brewers' dried grain

Ingredients	Starter Diet (0-3 wk)	Finisher Diet (4-6 wk)	Vanaraja chicks	RIR chicks
Yellow ground maize	55.00	60.00	43.00	50.00
Groundnut cake/Soybean meal	20.00	17.60	21.00	12.00
Fish meal	10.00	10.00	_	10.00
Wheat bran	7.78	6.03	_	6.30
De-oiled rice bran	-	-	13.00	-
Brewers' dried grain (BDG)	5.00	4.40	20.00	20.00
Dicalcium Phosphate	1.13	1.16	1.17	1.15
Common salt	0.40	0.40	0.50	0.40
L-Lysine HCl	0.36	0.22	0.03	0.02
DL-Methionine	0.14	-	0.06	-
Vitamin Mixture	0.04	0.04	0.04	0.04
Mineral Mixture	0.15	0.15	0.15	0.15

Cashew apple waste

The cashew is native to northeast Brazil in the 16th Century; Portuguese traders introduced it to Mozambique and coastal India, but only as a soil retainer to stop erosion on the coasts. In India vast tonnages of cashew apples have largely gone to waste while it pioneered in the utilization and promotion of the nut. Cashew apple (*Anacardium occidentale L*) is a promising feed source, which could be used for dairy cows and monogastric animals to some extent. In 1995, the whole country had 200,000 ha of cashew trees. From this area, about 500,000 tons of cashew apple will be produced per year. There is commercial interest in processing the fresh apple as a source of sugar-rich juice for human consumption. The waste product from processing, after drying, has been fed to pigs and poultry with promising results. Cashew apple waste (CAW) is available in plenty in the coastal states with an annual production of about 3, 82,000 metric tons. The average weight of fresh apple is about 74.33 grams having dry matter content of 10.22 per cent. CAW is obtained after extraction of fenny which can be used as a cheaper source feed ingredient for poultry by partially replacing costly energy source maize. The waste is usually sun dried and ground before incorporation

in the feed. Similarly cashew nut shell is the outer covering of cashew nuts which is not usually used for human consumption but can be used as a cheaper source feed ingredient for poultry.

Dried cashew apple waste

Chemical Composition

The chemical composition of cashew apple waste (CAW) varies according to the location and species from which the apple wastes are prepared. The range values (%) for the different chemical constituents of CAW and per cent composition of cashew nut shell (CNS) are given below in tabular form.

Chemical composition of cashew apple waste

Chemical constituent's	% Composition	
	CAW	**CNS**
Dry matter	18.40-22.50	-
Crude protein	6.45-11.40	5.00
Ether extract	3.35-11.04	11.7
Crude fibre	8.50-11.85	27.3
Total ash	3.51-6.15	1.39
Acid insoluble ash	1.26-1.42	0.20

Practical diets for Vanaraja growing chickens using cashew apple waste

Ingredients (%)	Vanaraja growing chickens
Maize	40.00
Groundnut cake	22.00
Fish meal	10.00
Wheat bran	17.74
CAW	8.00
DCP	1.00
L-Lysine HCl	0.16

Ingredients (%)	Vanaraja growing chickens
DL-Methionine	0.20
Common salt	0.40
Vitamin and Mineral mixture	0.50

Rice kani

Rice (*Oryza sativa*) is a staple food of most of the Indian states including Goa. Rice is a staple crop in tropical cereal crop is Asia, accounts nearly 90 % of the World's total production of 480 million tones. During the milling of rough rice or paddy, several by-products become available and include polished rice (50-60 %), broken rice (1-17 %), polishings (2-3 %), bran (6-8 %) and hulls (20 %). Rice kani (broken rice) a by-product obtained through milling of rough rice or paddy is a potential unconventional energy source for poultry feeding. Therefore, there is tremendous scope for using rice kani as a substitute for high energy feed ingredient maize in poultry feed in order to reduce the feed cost as well as the competition with human beings for conventional energy source i.e. maize. Another additional advantage is that rice kani is not associated with aflatoxin which pose threat to the survivability of poultry and other livestock.

Chemical Composition

The chemical composition of rice kani varies as per the sources from where it is collected, processing conditions and storage period. The range values for the chemical constituents of rice kani are given below in tabular form.

Chemical composition of Rice kani

Attributes	% Composition
Dry matter	87.90-95.50
Crude protein	7.19-11.41
Ether extract	1.4-1.5
Crude fibre	0.7-2.52
Total ash	0.3-3.30

Practical diets for Vanaraja growing chicks with inclusion of rice kani

Ingredients	% Inclusion
Ground yellow maize	35.00
Ground nut cake	23.00
Fish meal	10.00
Wheat bran	15.00
Rice kani	15.00
DCP	1.00
Limestone	-

Ingredients	% Inclusion
L-Lysine HCl	0.14
DL-Methionine	0.01
Common salt	0.40
Mineral mixture	0.25
Vitamin mixture	0.04

Cow pea leaves

Cow pea (*Vigna unguiculata [L.] Walp.*) is an important grain and fodder legume crop grown in many parts of the world. Cow pea is used at all stages of its growth including as vegetables . Harvested tender green cow pea leaves constitute an important leafy vegetable often prepared as salad like spinach, lettuce, amaranthus and cabbage for direct consumption.

Cow pea leaves ready for feeding

Chemical Composition of cow pea leaves

Attributes	% Composition
DM	12.00
CP	20.4
EE	1.24
CF	15.02
Total ash	11.72
Acid insoluble ash	0.92

Feeding value

Cow pea leaves (fresh) were fed to Vanaraja laying hens at an inclusion level of 75 g and 125g per day, respectively by replacing part of whole standard layer ration. First group was given standard layer ration @ 75g/hen/day and fresh cow pea leaves 75g/hen/day and second group was given standard layer ration @ 62.5 g/hen/day and fresh cow pea leaves @ 125/hen/day. The result of this feeding trial was compared with the control group. Results indicated that significant ($P<0.05$) reduction in egg production (dozen) was observed in group fed 125g cow pea leaves and pod/hen/day. However, laying hens fed 75g of fresh cow pea

leaves and pods/hen/day produced eggs similar to that of control group. Egg production record (kg mass) followed the similar trend as that of egg production in dozen. The egg weight was not affected by the feeding of cow pea leaves and pods. Feed intake was significantly ($P<0.05$) reduced based on the dry matter intake. Feed efficiency (feed intake in kg/dozen egg) was significantly improved ($P<0.05$) in 1st group fed cow pea leaves and pods @ 75g/hen/day. Feed conversion ratio (Feed intake in kg/egg production in kg) followed the similar trend. Feed cost to produce dozen egg was significantly lower ($P<0.05$) for both the experimental groups fed cow pea leaves and pods. This study indicated that cow pea leaves and pods can be fed to vanaraja laying hens for more income generation due to significant reduction in feed cost.

Unconventional cereals as alternative energy source

Bajra (*Pennisetum typhoides*) and Ragi (*Eleusine coracana*)

Coarse cereals like bajra ((*Pennisetum typhoides*) and ragi (*Eleusine coracana*) are abundantly available in most parts of India. The demand for maize has increased tremendously for use as human and other industrial use making it less available for animal feed. Millets grossly resemble maize in proximate composition except variation in protein and minerals. Replacement of maize with coarse cereals, reduces feed cost and pressure in use of maize. Bajra is satisfactory feed ingredient for laying hens that can be included in unground form at moderate levels as per the results of research work conducted by earlier workers. The proximate composition of the Bajra and Ragi is given below in tabular form.

Proximate composition of Bajra (*Pennisetum typhoides*) and Ragi (*Eleusine coracana*)

Attributes	Bajra (*Pennisetum typhoides*)	Ragi (*Eleusine coracana*)
DM	90.09-91.3	90.54-91.0
CP	8.36-10.89	8.34-8.36
EE	3.86-5.24	1.16-3.38
CF	1.97-2.80	3.28-3.66
Total ash	1.68-6.39	3.16-6.73
Acid insoluble ash	0.19-2.08	0.26-2.73
Calcium	1.9	1.7

Feeding Value

Effect of replacement of Maize with Bajra (*Pennisetum typhoides*) or Ragi (*Eleusine coracana*) on the performance of laying hens

Sixty three, 30 weeks old Gramapriya white laying hens were assigned to 21 groups with 3 laying hens in each group having approximately equal body weight. Seven experimental diets were formulated by replacing 50 and 100 percent of maize by unground and ground bajra and ragi. Data were recorded on egg production, egg weight, feed intake, feed efficiency, egg white and yolk contents, shape index ,shell contents and shell thickness. Egg production (Kgs) and feed efficiency (Kg feed/Kg eggs) of hens fed bajra (ground and unground) and

ragi (unground) by replacing maize completely were similar to those fed control diet with maize as a sole energy source. The egg weights of hens fed ragi replacing 100 % maize and bajra (unground) by replacing 50 and 100 % maize were similar to the egg weight recorded on control groups. The shell percentage was significantly ($P \leq 0.01$) higher in hens fed diet with 50 and 100 % maize replaced by ragi. A significantly ($P \leq 0.01$) higher shell thickness was recorded in laying hens fed diet with 100 % maize replaced by ragi. The shape index, % egg white and % yolk were similar in all the groups. Results suggested that unground bajra and ragi could replace maize completely in the diet of laying hens without affecting the egg production, egg weight, feed efficiency and other quality parameters in addition to production of stronger shell.

Effect of replacing maize by Ragi (Finger millet) on the performance of Gramapriya White chicks (1-8 weeks)

A feeding trial was conducted in 120 nos of 1 day old Gramapriya chicks to see the effect of replacing maize by Ragi at various levels on their performance. Four experimental diets were formulated by replacing 0, 25, 50 and 100 % of maize in the control diet with ragi. Each diet was fed to triplicate groups and each replicate had 10 nos. of chicks. The experiment was conducted in a completely randomized design and for a period of 8 weeks. Data were recorded on weekly body weight gain, feed consumption and feed efficiency was calculated. Result indicated that significant depression in body weight gain and deterioration in feed efficiency was observed in chicks fed diet with total replacement of maize by ragi. However, the feed intake remained uninfluenced. The body weight gains and feed efficiencies of groups fed control diet and diets with 25 and 50 % maize replaced by ragi were similar statistically. Cost of feed per kg meat production was lowest in chicks fed diet with 50 % maize replaced by ragi. It may be concluded that ragi could replace up to 50 % maize in the diet of laying Gramapriya white chicks without any adverse effect on their body weight gain and feed efficiency.

Poultry hatchery waste

The Poultry hatchery waste (PHW) is the product left over in the poultry hatchery after the hatching process is completed. Poultry hatchery waste is primarily composed of dead chicks, infertile whole eggs and shells from hatched eggs. This material is usually incinerated, rendered, or taken to sanitary landfills and used for composting. Each of these disposal methods has particular regulatory or operational requirements or economic characteristics that may enhance or limit its use within a particular farm. Since, the moisture content of the fresh hatchery waste is high, it makes the disposal and incineration costly to the producer and it may be unsafe environmentally. Chemical composition of processed poultry hatchery waste is given below in tabular form.

Chemical composition of processed poultry hatchery waste

Chemical Constituents	% Composition
Crude protein	22.80-44.25
Ether extract	14.40-30.00
Crude fibre	0.90-8.06

Chemical Constituents	% Composition
Total ash	14.00-40.00
Calcium	7.26-22.60
Total Phosphorous	0.39-0.84

Feeding value of processed Poultry hatchery waste in Vanaraja chicks

To study the effect of feeding processed poultry hatchery waste (PHW) on the growth performance in Vanaraja chicks. 120 (2 wk) Vanaraja chicks were randomly distributed in to 4 equal groups with 3 replicates and fed on diets prepared by inclusion 0, 2, 4 and 8 percent processed hatchery waste by replacing 0, 25, 50 and 100 percent fish meal of the control diet. The PHW was cooked at 120 lb for 30 min., dried in hot air oven and analysed for proximate composition. Results on performance study indicated significant ($P<0.01$) increase in body weight gain due to incorporation of processed hatchery waste at all the levels in the diet of chicks at 7 week of age by replacing fish meal at 0, 25, 50 and 100 % levels (Table 52). Significant ($P<0.01$) improvements in feed conversion ratio (FCR), protein efficiency ratio (PER) and performance index (PI) in chicks were observed due to feeding of PHW at all the levels. Maximum net profit was recorded due to feeding of 8 % PHW as shown below in tabular form.

Conclusion

The agro-industrial by-products like brewery waste, cashew apple waste, cashew nut shell, rice kani (broken rice), alternative cereals like ragi, bajra and green fodder like cow pea leaves, are available in plenty locally. Presently these by-products are not exploited to full extent for inclusion in the poultry feed. These by-products and fodder leaves have good nutrient composition and reported to contribute to the productive value for egg and meat with reduction in cost of production. Hence, keeping their chemical composition and potential feeding value in consideration, these by-products can be incorporated to some level in the poultry feed formulations to economise the feed cost and to increase the profit margin for the poultry farmers.

View publication stats