Regional Report

Examining the nutritional and production characteristics of egg-farms of Basmakci County in Turkey

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The first attempts in producing table-eggs for Turkish market within the farms have been initiated in Basmakci County in 1974. Since then, the farmers have started to produce table-eggs with their own efforts, and by a rapid development Basmakci is now the main egg-centre of Turkey. However, there have been several factors having negative impacts on the egg production in Basmakci. This study involved in the investigations on the nutritional and husbandry characteristics of egg production. The present work outlined the structure of egg production along with the present problems of management, nutrition-feeding and environment. The type of production for Basmakci's producers can be evaluated as commercial egg production within the farm enterprise as a second income. The producers have set up the Association of Basmakci Egg Producers (ABEP) to deal with the problems of only supplying the hen breeds and marketing the egg. However, some important problems were encountered for the production drops during the course of the present investigation: The old-conventional cage systems (A type and California type) are still preferred by the farmers in the egg-business due to financial problems. The most important commercial breeds of layer hens have been bought in for egg production, but the field tests of these breeds have not yet been done by the commercial breed companies under the Basmakci conditions. Neither indoors house environmental conditions nor least-cost feed formulation were found not to be well controlled for the sake of optimum egg production. The producers failed to keep continuous and meaningful production records, and this causes to difficulties of implementing different feeding programs and management solutions. Manure management and other health related issues are still being ignored by the producers. However, in order to improve the production level we suggested that poultry extension works have to be established here with the strong collaborations between the Universities, Egg Association, Breeder Companies and Agricultural Ministry.

Key words: egg production; Turkish market; Basmakci County; nutrition and management

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History of Basmakci in Egg Business

The history of Basmakci in the egg business goes back to 1974 during which some farmers decided to rear layer hens on the second-hand bought cages (A type cages). These producers were so successful in the business that the remained farmers of the county decided to involve in. When it was 1984, a non-refundable government financial support was allocated to the farmers in order to improve and extend the production level from a family scale to commercial scale. Unexpectedly, no technical advises or helps were provided by the state or bought by the farmers during the construction of and designing these new poultry houses and selecting the appropriate indoor equipment. The number of egg-producers has markedly exceeded over 2000 in Basmakci under the influence of non-refundable state grand by 1990. Then, in 1987 Association of Basmakci Egg Producers (ABEP) was established to ease the problems related with the supply of dietary raw materials and layer chicks, feed formulation, disease control and prevention and egg-marketing. ABEP has, in fact, become very helpful to its members, especially in the area of supplying different types of layer chicks, egg marketing and establishing a feed manufacturing plant in the county. However, many big economic crises, one in 1994 and the others in 2001, adversely lead to significant changes in the production and the finance of the producers of ABEP. According to the present records of ABEP, only 90 members actively survived to run the business (ABEP, 2001) from the nationwide economic crises in 2001.

The egg production figures in Turkey for the years of 1996, 1997, 1998, 1999 and 2000 were around 10 269, 9 782, 7 136, 9 056, 6 695 and 4 894 million eggs per year, respectively (Akman, 2000). It can be seen that the egg production has markedly reduced in recent years due to the financial and economic problems in Turkish market. This has also very negative effects on the egg producers in Basmakci although they have an Association dealing with the solution of problems to some extents.

Basmakci poultry enterprises are targeted at this time to study their structural properties of egg production, and the data obtained from the present survey will provide a basic understanding to form the future poultry extension works at the county.

Basmakci egg producers were visited in October 2001 where there were totally 90 egg producers managing to produce the egg in the region followed by the two economic crises occurred in the year 2001. There were many houses (around 1500) which were closed up for egg production in the region. The survey was lasted for 2 months and included only 25 randomly visited producers. Each producer was randomly selected and personally contacted at farm. All of the poultry houses belonging to each producer were visited to take important measurements while the questions of the previously prepared survey were consequently asked to each producer. Six producers were excluded from the study for various reasons: 2 farmers were not available at the farm, 3 farmers rejected to involve in, 1 farmer was excluded due to improper data obtained. The present survey was, therefore, conducted with only 19 egg producers. In the survey, totally 40 poultry houses of 19 owners were inspected.

Some production, nutritional and management measurements were taken from the houses. Additionally, samples of feed rations were randomly taken from 5 different egg-farms for the analyses of major nutrient contents. The ammonia production, relative indoors humidity and temperature of all poultry houses were measured at 4 different locations three times per day for 4 days. The daily performance data, particularly egg figures, obtained from the farmers for the last 2 months were not directly compared between the houses since the age of the studied house flocks differed (52.2 ± 15.2 weeks-old). Thus, the egg yield was presented as the positive or negative difference (in percentage) compared with the value of a standard laying curve for the corresponding age

of the corresponding breed. For the appropriate data analyse, the study parameters were scored and then subjected to statistical analyses under a statistical package program, SPSS for Windows (release10.0.1).

Structural and production characteristics

There were 19 family enterprises visited during the survey. The mean age of owners was 43.05 ± 11.67 (mean ± standard deviation) year-old with minimum and maximum values of 24 and 69 year-old, respectively. Approximately 16% of farmers aged between 21 and 30 years old whereas only 5.3% of farmers aged between 61 and 70 years old. Forty two percent of farmers fall into 31 to 50 years-old age group while 26.3% fall into 51 to 60 years old. Of the owners of poultry houses, 73.7% were egg-producers, 21.1% were tradesmen and only 5.3% were farmers. The sex of owners was all male.

The mean hen capacity of 19 poultry enterprises was 19 342 hens per enterprise with a standard deviation of 12 208 (*Table 1*). The minimum and maximum hen capacities were 2 000 and 40 000 hens per enterprises, respectively. The number of enterprises with 1, 2, 3 and 4 poultry houses were 6 (31.6%), 6 (31.6%), 6 (31.6%) and 1 (5.3%), respectively. The number of poultry houses per enterprises averaged as 2.1 houses per enterprises with a standard deviation of 0.9 (*Table 1*).

Table 1 Percentage distribution of total bird capacities and number of poultry houses per enterprise.

Total capacities	Frequency	Percentage	Number of Houses	Frequency	Percentage
1000 to 10000	5	26.3	1	6	31.6
11000 to 20000	7	36.8	2	6	31.6
21000 to 30000	4	21.1	3	6	31.6
31000 to 40000	3	15.8	4	1	5.3
Total	19	100	Total	19	100
Mean	19342.10		Mean	2.1	
Std. Deviation	12208.00		Std. Deviation	0.9	
Minimum	2000.00		Minimum	1	
Maximum	40000.00		Maximum	4	

From the examination of *Table 2*, it was noted that 42.5% of poultry houses have 5 100 to 10 000 hen per house while 25% of houses with 1 000 to 5 000. Twenty eight percent of houses have 11 000 to 15 000 and only 5% of houses with 15 100 to 20 000 hen per house. Similarly, the figures of daily egg production per hen house showed that none of houses have an egg production over 15 000 per house per day while 55% of houses have an egg production between 5 100 to 10 000, 32.5% with 1 000 to 5 000 and only 12.5% with 11 000 to 15 000 eggs per house per day. The average of egg yield per hen housed was 76.48 ± 13.6% and the minimum and maximum values were 41.25 and 96.00%, respectively. Approximately 75% of houses had over 70% egg yield per hen housed while 25% of houses with 40 and 70% (*Table 2*).

Twenty-one (52.5%) out of 40 poultry houses had layer hens aged between 41 and 60 weeks old whereas 12 houses (30%) with 61-80 weeks-old hen age and only 7 (17.5%) houses with 20-40 weeks-old hen age. The average hen age of all houses was 52.2 ± 15.2 weeks-old.

Eighteen poultry houses (45%) had a California type layer cage while 14 houses (35%) had an A type and only 8 houses (20%) had a compact cage (with automated manure band and automated feeding and drinking system) in the poultry house (*Table 3*). Hen breeds of Hyline, Loghman, Bowans, Hisex and Babcock were recorded to be reared in 18 (45%), 13 (32.5%), 4 (10%), 4 (10%) and 1 (2.5%) houses, respectively.

Table 2 Hen number and egg production per poultry house in the studied enterprises.

Hen per house	Frequency	%	Eggs per house	Frequency	%	Egg yield (egg per hen housed, %	Frequency	%
1000-5000	10	25.0	1000-5000	13	32.5	40-55	3	7.5
5100 -10000	17	42.5	5100 -10000	22	55.0	56-70	7	17.5
11000-15000	11	27.5	11000-15000	5	12.5	71-85	16	40.0
15100-20000	2	5.0	15100-20000	0	0.0	86-100	14	35.0
Total	40	100	Total	40	100	Total	40	100
Mean	8996.25		Mean	6845.73		Mean	76.4763	
Std. Dev.	654.81		Std. Dev.	3315.33		Std.Dev.	13.5853	
Minimum	2000.00		Minimum	1500.00		Minimum	41.25	
Maximum	17000.00		Maximum	12300.00		Maximum	96.00	

Table 3 Frequency and percentage of the studied poultry houses in term of hen age, cage type and hen breed.

Age of hen, week	Frequency	%	Cage type (code)	Frequency	%	Hen breed (code)	Frequency	%
20-40	7	17.5	A type (1)	14	35	Hyline (1)	18	45.0
41-60	21	52.5	California (2)	18	45	Loghman (2)	13	32.5
61-80	12	30.0	Compact cage (3)	8	20	Bowans (3)	4	10.0
						Hisex (4)	4	10.0
						Babcock (5)	1	2.5
Total	40	100	Total	40	100	Total	40	100.0
Mean	52.2		Mean	1.85		Mean	1.92	
Std. Dev.	15.2		Std. Dev.	0.73		Std. Dev.	1.09	
Minimum	24		Minimum	1		Minimum	1	
Maximum	80		Maximum	3		Maximum	5	

The mean length of whole cage block in a single row in poultry houses was 47.1 ± 7.48 meter (m) with 24.00 and 55.00 m minimum and maximum values. Twenty-five percent of houses had an average cage block length ranged from 24 to 40 m, 52.5% of houses between 40 and 50 m and 22.5% of houses between 50 and 55 m of block length. The length of cage blocks did not significantly differ between the cage systems. The average block height was 2.0 ± 0.19 m with 1.5 m minimum and 2.5 m maximum values. The percentage of poultry houses with 1.5 to 2.0 m block height was 22.5% while 77.5% of houses had block height ranged from 2.0 to 2.5 m. Furthermore, no significantly differences were observed between the cage types in block heights. The mean, minimum and maximum of a single cage length in Basmakci poultry houses were 47.37 ± 3.90, 40.00 and 50.00 cm, respectively. The percentages of poultry houses with 40, 45 and 50 cm of cage length were 17.5, 17.5 and 65%, respectively. The cage length significantly

(P<0.05) differed between the cage systems. The lowest cage length was with A type cage system and the highest length was with Compact cage system. The corresponding values for A, California and Compact cage systems were 45.41, 47.90 and 48.90 cm, respectively. The means of a single cage height and cage depth were 45.85 ± 3.54 and 43.45 ± 4.05 cm, respectively. No significant (P>0.05) differences were observed between the cage systems in the parameters of cage height and cage depth.

In Basmakci poultry houses, the average number of cage tiers was 3.02 ± 0.53 with 2 and 4, minimum and maximum values, respectively. Of poultry houses, 12.5% of houses had 2 cage tiers, 72.5% with 3 cage tiers, and 15% with 4 cage tiers. The number of cage tiers significantly (P<0.05) differed between the cage types. The A type cage systems had significantly lower number of cage tiers (2.58 ± 0.11) than the other cage systems. The number of cage tiers in California cage systems was also significantly different from California cage systems, 3.05 ± 0.09 versus 3.55 ± 0.13, respectively

In Basmakci poultry houses, the mean number of birds per cage was 5 ± 0.45 with 4 and 6 bird/cage of minimum and maximum values. No significant differences were observed between the cage systems in the number of birds per cage.

Average egg production (egg per hen housed per day) and age of breeds in Basmakci were presented in *Table 4*. The breeds of Bowans showed highest egg per hen housed per day. This was followed by Loghman, Hisex, Hyline and Babcock. The youngest flocks were Hisex breed and the oldest flocks were Babcock breed. Highest egg production was obtained from the flocks kept in Compact cage systems and this was followed by California and A type cage systems in Basmakci. On the other hand, the flock age was nearly similar for all the housing systems (*Table 4*).

Table 4 Egg yield and hen age by hen breeds and cage types in Basmakci.

Breeds* **Mean ± SD**	**Egg yield (egg per hen housed, %) Mean ± SD**	**Hen age**	**N**
1.00	74.88±15.22	54.67± 14.60	18
2.00	76.60±8.70	55.77±12.79	13
3.00	87.50±5.80	47.00±17.08	4
4.00	76.32±21.95	30.75±7.27	4
5.00	60.00±	68.00±	1
Total	76.48±13.60	52.20±15.27	40
Cage types† Mean ± SD	**Egg yield (egg per hen housed, %) Mean ± SD**	**Hen age**	**n**
1.00	75.23±13.50	53.00±13.62	14
2.00	77.10±16.00	48.77±17.30	18
3.00	77.21±7.83	58.50±12.27	8
Total	76.48±13.60	52.20±15.27	40

n = number of hen house
* Breeds: 1 hyline, 2 loghman, 3 Bowans, 4 Hisex and 5 Babcock
†Cage type: 1 A type cage, 2 California and 3 Compact cage.

Egg yield was given as the positive or negative difference (in percentage) compared with the value of a standard laying curve for the corresponding age of the corresponding breed. All the negative and positive differences were subjected to statistical analyse and no significant difference (P>0.05) was found between the breeds and between the cage types. However, the smallest differences between the house egg production and the standard

laying curve of corresponding hen breed were observed with Loghman breeds whereas the largest differences were seen with the breed of Hisex. The breed of Bowans showed a greater laying performance than the standard laying curve of the same commercial breed. Of the cage types, the compact cage system were considered to show a greater egg production level than the A type and California type cage systems due to large standard deviation with the latter cage systems.

Nutritional and feeding characteristics

There were two types of drinking systems observed in Basmakci poultry houses; conventional plastic one side open pipe system and automated nipple drinker system. The first system is practised in 27.5% houses while the latter in 72.5% of houses. However, the plastic water pipes were only observed in the houses of A type cage system whereas the nipple drinker systems were common in the houses of California and Compact cage systems. There was only one type of feeding system seen in Basmakci poultry houses, the mechanical feed delivery systems with mobile feed carts run by manually or automatically. In 35% houses, the feed cart is delivered to the whole feeder by hand whereas in 65% houses the feed cart is automated. All of the houses with A type cage systems and only a small number of houses with California type cage systems had manually delivered feed carts and there was no automation in feeding systems whereas most of the houses of California and all of the houses of Compact cage systems had automated feed delivery systems. We have personally observed, but not statistically scored, that in the houses of A type cage systems, the feed spillage was too high and frequently get wet by the non-automated drinking systems. This was also seen to cause health and management problems in those houses.

The rations and feed mixture for layer chicks and hens are often prepared by the producers in a feed mill operating unit within the farm. Approximately 62.5% of farmers owned a mill and a mixer. The farmers owned a medium size-mill and mixer for their own feed production. There are two types of feed mill preferred to be used by the farmer, hammer or roller mills. The percentages of farmers using hammer mill and roller mill were 64 and 36%, respectively. The mean capacity of feed mills was 2.72 ± 1.13 ton/h with minimum and maximum values of 1 and 4 ton/h, respectively. The type of mixer preferred by the Basmakci's farmers was horizontal mixer. The mean, minimum and maximum capacities of mixers were 1.19 ± 1.08, 0.5 and 4 ton/h, respectively. The most of feed ingredients are being bought into the farm through the ABEP. However, the farmers are no longer provided with such a service by the ABEP in recent years. A typical composition of the feed ration for layer hens was based on corn, barley, soybean meal, fulfat soya, meat and bone meal and fish meal.

From the randomly chosen 5 different farms, 3 samples of layer feed ration for the first laying phase were taken from each farm to analyse the nutrient contents of crude protein, crude fat and crude fibre. It was found that the mean of crude protein was 170 ± 1.2 g per kg total feed, the crude fat content averaged as 3.0 ± 0.4 g/kg , the crude fibre content level averaged as 4.8 ± 0.3 g/kg. The calculated ME, total lysine and methionine contents averaged as 2763 ± 20, 0.32 ± 0.05 and 0.87 ± 0.03. The ME, lysine and methionine levels were evaluated to be optimal.

The farmers were found not to be aware of the fact that how the changes in feed intake of layers when they get older can affect the egg performance. The nutrient density of layer hens can be changed during both the seasons and the different ages of hen (Erensayin 2000). Although the farmers did not exactly measure how much their birds consume the feed, they have roughly been producing only two types of feed rations: the one for layer

phase 1 (from 20 to 42 weeks) and the other for layer phase 2 (>42 weeks). They do not change the diet specifications to minimise the feed cost for an optimum egg production. The phase feeding is very essential and economical to be considered in layer hen feeding, particularly for the dietary calcium and phosphorous nutrition, under the precise monitoring of egg production, body weight, feed intake and egg weight (Sell et al., 1987). The Basmakci's producers did not adjust the dietary mineral contents for calcium and phosphorous during the whole production cycle.

The least-cost formulation of layer rations is found not to be considered by the individual farmers since the availability of feed ingredients is more important than the cost for them, and there is also a risk to manipulate the inclusion rates of dietary ingredients. The corn is the main dietary ingredient in poultry nutrition in Turkey. Wheat is not preferred since all wheat goes into human consumption in Turkey and the wheat price is higher than that of corn. Almost all of corn is imported from USA for the Turkish Feed Industry along with the soybean meal. Feed texture in Basmakci's layer feed rations was almost mash, except that a few farmers owned compact cage systems have been using pellet feed texture. In a study carried out by Portella et al. (1988) layer hens preferred large particles rather than mash or crumbles. The relationships between the nutritional regimes of layer hens and the changes in egg performance must be explained to the farmers.

None of the layer houses were in moulting during the time of house visits. It was reported that moulting is generally practised from June to late August of each year during which the egg price decreases in Turkish market. All the producers buy day-old layer chicks through ABEP. The moulting program is suggested to prolong the productive life of layers, and the aim is not necessarily to induce a feather moult (Leeson and Summers, 1997). In Basmakci, only the feed withdrawal is practised as moulting method and the control of body weight which is the most important criterion in moulting is not considered in Basmakci.

Flock records

During the survey, we tried to bring about whether the producers regularly record important production parameters such as feed intakes, live weights, egg classification, the percentage of cracked eggs and mortality. Unfortunately, none of the egg producers record feed intake and weight gain of poultry neither from day old to pre-laying period nor during the egg production period. Therefore, no comparisons are made between the flock's performance and the models provided by the supplier of breeders. Since the live weight is not monitored the producers have no means of controlling feed intakes of their flock to introduce birds with an ad libitum or restricted feeding programme in order to minimise the production costs (Erensayin, 2000). In Basmakci's poultry houses the eggs produced within the ABEP are classified on the basis of traditionally developed egg scale. This typical Turkish egg classification is now introduced into the literature with native spelling. The egg producers have developed an egg classification method which resembles with the sizes of layer hens. For instance, the Pilic (young pullet, 46 to 50 gram in weight), Yarka (Old pullet, 51 to 55 gram in weight), Yeni ana (Young hen, 56 to 60 gram in weight) and Eski ana (Old hen, 61 to 65 gram in weight) resemble with the sizes of hens of different ages, except the classes of Klavuz (the guide egg, 40 to 45 gram in weight), Duble (big, 66 to 70 gram in weight) and Super duble (extra big, <70 gram in weight). The prices of these egg classes increase from Klavuz to Super duble in the market. However, the consumers are not informed by appropriate label on the table eggs to differentiate between the egg classes.

Yearly egg production was also studied in Basmakci according to each of the egg classes from 1997 to 2001. Overall, the production percentage of Duble, Eski ana and Old ana

were significantly higher than that of Yarka, Pilic and Klavuz eggs. Furthermore, it can be said that the total yearly egg production drastically dropped by about 40% from 140 698 000 eggs in 1997 to 86 066 000 eggs in during 2001.

In the poultry houses, the number of dead birds and the number of cracked eggs are measured. These data of above parameters were obtained for two months from the producer. The parameters of cracked egg and mortality in Basmakci's poultry houses were expressed as percentage. The data were then statistically analysed between the hen breeds and between the cage types. The mean, minimum and maximum values were 1.39 ± 1.1, 0.04 and 4.0 for the percentage cracked egg, and 3.27 ± 1.6, 1.0 and 7.0 for the percentage mortality, respectively. Fifty percent of poultry houses had 1% cracked eggs and the percentage of houses having between 1 and 2% cracked eggs were 25%, and 25% of poultry houses had more than 2% cracked eggs. The percentage of poultry houses with 1 to 2% mortality was 27.5%, the percentage of houses with 2 to 4% mortality was 50%, and that with more than 4% mortality was 22.5%. The percentage of cracked eggs was significantly ($P<0.05$) higher in A type cage systems than that of California and Compact cage systems. Similarly, the egg production was also lower with A type cage system. Although the percentage of cracked eggs was numerically high in Compact cage systems compared to California cage systems the difference between these two cage systems in the percentage of cracked eggs was not significant ($P>0.05$). In contrast to the cracked egg parameter, the lowest mortality value was obtained from the houses with California cages whereas the highest values was obtained from the houses of compact cages, and the mortality rate in A type cages was at moderate level. Similarly, the percentage cracked eggs was also studied between the breeds reared in Basmakci. The highest and significant number of cracked eggs was observed with Babcock breeds whereas the lowest percentage of cracked eggs observed with Hisex breeds, and the cracked egg percentage for other breeds was moderate. The lowest mortality value, 2%, was obtained from Babcock breeds in contrast to the highest percentage of cracked eggs whereas the highest mortality, 4%, was obtained from the Loghman breeds, and the mortality rate for other breeds was between 2 to 3%. However, the mortality rate is not compared with the standardised field figures of breeds reared in houses since no such field records were yet performed by the breed distributors. On the other hand, we believed that the mortality rate and the percentage of cracked eggs must have been higher than the present data provided by the farmers since we observed that they are not good at keeping such records efficiently.

Indoors environment conditions and hygiene

The average ammonia production was 18.37 ± 8.22 ppm, with 6 and 34 ppm of minimum and maximum values, respectively. The percentage of houses with less than 15 ppm ammonia was 47.5%, the percentage of houses between 15 to 20 ppm ammonia was 15% and those more than 20 ppm was 37.5%. In statistical analyse, there was no significant difference between the cage systems in ammonia concentration. However, there was a significant negative correlation ($r= - 0.64$) between the egg yield and ammonia concentration. The ammonia concentration was too high with the houses of low egg yield percentage whereas it decreased with the increased egg yield. The mean indoors temperature was 22.08 ± 4.43ºC with 12 and 27ºC of minimum and maximum values, respectively. There was a significant difference between the different cage systems in indoors temperature; the lowest temperature (19ºC) was with the houses of A type cage and the highest temperatures (23.3 and 23.4ºC) were observed with the houses of California and Compact cage systems. The mean of indoor's relative humidity was 34.17 ± 7.60% with 21 and 62 of minimum and maximum values, respectively. The percentage

of houses with between 12 and 35% humidity was 77.5% while the percentage of houses with 35 to 62% humidity was 22.5%. No significant differences between the cage systems were observed in relative indoor's humidity.

None of farmers have no a precise control of transmission of diseases at the main entrance of each house. Visitors are freely allowed by the producers to get into the houses, and they did not practised any kind of disinfectants at the threshold and provide the visitors with gloves and boots at the entrance. As an over of evaluation of indoors air quality and equipment cleanness, no good or best houses were detected to comply with a standard health condition. The light intensity was too low although the ventilation rate was found to be normal. In Basmakci poultry farms, the dead bird disposal is not well practised with successful methods of rendering, composting, incinerators and disposal pits (Erensayin 2000). Nearly 50% of the hired workers complied about the low rate of payments by the poultry owners, therefore, the payment rate was found to affect the quality of labour management within the houses. Beak trimming is done once at a very early age (first week of age) or twice (a second permanent trimming at 6 to 12 weeks of age) for the prevention of feather pecking and cannibalism. No detailed information were taken on the beak trimming such as amount of beak to remove, sharpness of the blade, temperature of blade, and angle of the cut (Erensayin, 2000).

The vaccination method is implemented by the supplier or distributors of commercial hen breeds. The producers have long been practised to vaccinate their flock by themselves. None adequate equipment were used for vaccination such as medicators or dozatrons. Similarly, twenty-five percent poultry houses practised improper use of commercial liquid products of feed additives.

Natural ventilation system was commonly used in all of the houses with A and California type cage systems. All of the houses with A type cage system had natural ventilations with appropriate numbers of air inlets and outlets whereas 84% of houses with California cage system had natural ventilation and only 16% had environmentally controlled ventilation system. On the other hand, all of the poultry houses with Compact cage system had environmentally controlled ventilation system with automated fans and cooling pads. A conventional lighting programme is generally practised as 8 h dark and 16 h day light. Natural lighting through the house windows was seen to be utilised by the producers whereas none of poultry house has the full-controlled artificially lighting program. The artificial lighting equipment varied from the light bulbs (generally in old poultry houses with A type cage systems) to compact fluorescent (in the houses with compact cages) at different light intensity. The light intensity was also not taken into account in any of poultry houses although Lewis and Morris 1998 stated that poultry may not perceive low frequency fluorescent light as discontinuous (at least in Europe) and only in one study has been shown laying fowl preferred incandescent lighting. However, in practical conditions the light intensity and the method of lighting become important in order to control the feeding and production (Erensayin 2000).

The method of manure management was seen to vary with the type of poultry house systems in Basmakci. There were three methods of manure management employed in poultry houses; deep litter systems (37% of houses) in all of the houses of A type cage system where the manure is stored for longer periods (in Basmakci this period ranged from 1 to 6 months), the electrically operated manure scrapers (40% of houses) in all California cage systems and automated manure bands (22.5% of houses) in all Compact cage systems where the manure is daily delivered outside the houses. Basmakci producers did not take the appropriate steps to insure that the stored manure does not result in any nuisances (run-off, odour, flies, etc.). Furthermore, no particular concern is given to the potential for polluted drainage from storage units or percolation into ground water.

Conclusions

The egg production of the Basmakci's poultry houses subjected to the present survey was regressed against to the cage type, hen breed, mortality, the percentage of cracked eggs, ammonia level, humidity and temperature of houses, ventilation methods, manure storage period and method, feeding and drinking systems. Of the experimental parameters, there were only two independent variables to be significant in the regression analysis: cage type and hen breeds. The regression coefficient, R, was 0.84. The regression equation for egg production by only cage type and hen breed was as follows:

Egg production = 1536.85 + 3422.11 Cagetype – 664.26 Henbreed

As indicated in the related section, the cage type had a significant effect on egg production: the egg figures are significantly higher with Compact cages than California and A type cages. On the other hand, the effect of hen breeds on egg production was negative in regression equation.

This result indicated that cage systems and hen breeds are the most important parameters for the egg production in Basmakci country.

The results of present survey revealed that Basmakci still has a great potential in egg business if the problems outlined by the present survey can firmly be handed and overcome by the authorised bodies. The egg production slumps in Basmakci generally fall into the following categories: False slumps, environmental, management or nutritional and result of disease. The false slumps were seen to be due to the results of poor record keeping (see relevant section). This lead to difficulties of implementing different feeding regimes (restricted, choice and phase feeding) in poultry houses.

In the Basmakci poultry houses, the varied types of cage systems were common. We can speculate that the old and conventional types of cage systems may have been blamed for the production slumps in Basmakci. The high ammonium levels, changes in temperature, pressure and draft within the houses were the other remaining environmental factors being responsible for the production slumps. We have seen significant changes in the routine management of poultry houses. These were the behavioural changes of the caretakers/workers and the time of feeding. Since the labour in Basmakci is not paid at adequate levels (the average monthly income of a worker is about $ 100) the poultry houses in Basmakci and the layer hens are not maintained well in terms of health, production and environmental control.

Nutrition obviously played a role in production drops, because any deficiency of most nutrients was not be tolerated by the birds for long periods. The problems we have observed in Basmakci's feed production and nutrition routines were imbalances of nutrient levels in the feed rations, no detailed phase feeding program, improper feeding program for moulting, no routine feed analyses, no control of ingredient quality, no precise control of market feed prices, no alternative feeds for corn, no least-cost formulation and so on.

In short, poultry extension activities must be set up in Basmakci by a strong corporation of University researchers, Agricultural Ministry and ABEP in order to provide the farmers with technical and practical advice. The producers of Basmakci must somehow be assured against to the negative consequences of unexpected economical crises which can be happen in Turkey at any time. This can be evaluated in a future survey to cover all the financial and marketing problems of Basmakci producers.

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