EUROPEAN CONSUMER PERSPECTIVES ON EGG QUALITY

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Summary

A number of consumers in Spain and Europe were interviewed with the objective of validating and ranking in eggs some food quality attributes proposed by the European Consumer Association (BEUC). Results showed how “Safety” and “Freshness” were the most important quality factors. “Nutritional value” and “Sensory characteristics” being also key elements according to consumers’ opinions. Since 1997, additional surveys have been conducted in France, Germany, Italy, UK, Spain, Poland, and Greece to find out how consumers perceive egg quality from a sensory point of view. Consumers defined egg quality as related to shell strength, albumen consistency, and intense yolk colour. When offered egg samples with different yolk colours (8, 10, 12 and 14 in the DSM-Fan) a majority of surveyed persons in all countries preferred colour 14, the deepest one. Carotenoids have been historically used by the feed industry to provide the homogenous yolk colour demanded by consumers although recently researchers have started to work on the potential biological benefits of some carotenoids for animals and humans.

Levels of most vitamins in eggs are directly linked to the levels in the diet of the hen. Layer feed conversion rates have improved dramatically (approx. 40%) during last 30 years so that it is essential to re-evaluate vitamin levels in feed accordingly. Recent research has compared the effects of two vitamin levels in laying hen diets (average industry levels versus optimum vitamin nutrition (OVN) levels) on the vitamin deposition and quality of eggs. Results indicate that almost all vitamin levels (A, E, B1, B2, B12, pantothenic acid, folic acid, biotin) found in whole egg were statistically increased when hens were fed OVN premix (although not enough to be considered as vitamin enriched eggs), thus improving the nutritive value compared to control eggs. Nutraceuticals such as vitamin enriched eggs are another way to increase their added value which is of particular interest for some specific vitamins like folic acid and most recently vitamin D. Long-term lack of vitamin D increases the risk of osteoporosis and fractures in older age groups; now an important proportion of European consumers. Recent experiences in laying hens fed a combination of vitamin D and its active metabolite, 25-hydroxyvitamin D added in the diet as HyD®, show the possibility of enriching eggs with vitamin D under EU conditions, where a maximum vitamin D level of 3,000 IU is set for layers.

I. INTRODUCTION

In November 1999, Beate Kettitz, Food Officer at the European Consumer Organization (BEUC), pointed out some of the most relevant factors for consumers when judging food quality (Kettitz, 1999). The proposed list was as follows with no special order of importance:

- Appearance and organoleptic perception: flavour, taste, texture, etc
- Safety
- Nutritional value
- Clear labelling
- Brand’s reputation

1 DSM Nutritional Products Ltd., CH-4303 Kaiseraugst, Switzerland
• Convenience
• Product consistency
• Suitability for specific occasions
• Ingredients
• Price
• Packaging
• Origin
• Ethical aspects
• Environmental considerations

In order to obtain sound consumer feedback about the “food quality package” suggested by BEUC, several consumer studies were run by professional consumer research companies on a national basis. The first objective was to validate with consumers in those markets whether those attributes covered most of characteristics, factors, items, etc on food quality mentioned spontaneously by consumers from different geographical, social and economic conditions. The second objective was to rank, after a quantitative phase, the final food quality factors obtained previously and, therefore, define the priorities which should be taken into account when trying to fulfil food quality and the consumers' needs.

a) Egg quality surveys: BEUC attributes

Germany (Hernandez and Seehawer, 2001) and Spain (Hernandez, 2000) were the markets initially selected to undertake this consumer research with the objective of validating and ranking those attributes proposed by BEUC in eggs. These countries were chosen for this research due to their different social, economical, cultural and geographical characteristics, accounting at the same time for a good portion of the European consumer population (around 120 million persons).

T.I.P. Biehl and Wagener conducted the survey in Germany and Centro Informático de Estadísticas y Sondeos S.A. did the same in Spain. Both studies were run independently in 2000/01 and structured in a similar way through two phases (Figure 1).

Universe: persons older than 18; in Spain living in towns/villages with more than 1,000 inhabitants (99% of the Spanish population). In Germany, national representation was guaranteed by calculating the sample in this study from the eight Nielson geographical areas commonly used in national consumer research.

Sample size in Spain: 3,100 telephone interviews distributed geographically by Comunidad Autónoma (17 Regions in Spain) and matching quite closely the average Spanish consumer profile (sex, age, studies/incomes). Sample error of +/- 1.76%, for p=q=50 and 95% interval of confidence.

Sample size in Germany: 2,000 telephone interviews distributed geographically by Nielson Area (8 Areas in Germany). Sample error of +/- 2.01%, 95% interval of confidence.

As indicated in Figure 1 and 2, results show how “Safety”, “Hygiene” and “Freshness” were the most important quality factors, “Nutritional value” and "Sensory characteristics" being also key elements according to consumers' opinions.
Figure 1. Ranking (0-10) of “Food Quality Parameters” (BEUC) for Eggs in Germany, 2000 (2,000 consumers).

Figure 2. Ranking (0-10) of “Food Quality Parameters” (BEUC) for Eggs in Spain, 2001 (3,085 consumers)
b) Consumer surveys on the sensory aspects of egg quality

Since 1997, additional studies with more than 2,000 consumers have been conducted in European countries such as France, Germany, Italy, the UK, Spain, Poland, and Greece to find out how consumers perceive egg quality from a sensory point of view.

Consumers defined egg quality through the tangible characteristics of the egg, most especially shell strength, albumen consistency, and intense yolk colour. When offered egg samples with different yolk colours (8, 10, 12 and 14 in the DSM Fan) a majority of surveyed persons in all countries preferred colour 14 (Hernandez et al., 2000). Figures 3, 4, 5 and 6 show this data in more detail as well as its relative importance in the main countries evaluated.

Figure 3. Criteria for a Quality Egg Shell in Europe. “What would you expect the shell of a quality egg to be like?” n= 2,122 consumers (multiple response)
Figure 4. Criteria for a Quality Egg Albumen in Europe. “What would you expect the white of a quality egg to be like?” n = 2,122 consumers (multiple response)

Figure 5. Criteria for a Quality Egg Yolk in Europe. n = 2,122 consumers (multiple response)
Carotenoids have been historically used by the egg industry to provide the homogenous yolk colour demanded by consumers. Recently researchers have started to work on the potential biological benefits of some carotenoids for animals and humans. Recent data support the hypothesis that dietary canthaxanthin in breeders can modulate antioxidant systems in the developing chick as well as contribute to decreasing embryo mortality during hatching (Surai et al., 2003). On the other hand a large number of epidemiological studies in humans indicate that dietary intake of lutein and zeaxanthin is associated with a reduced risk of cataracts and age-related macular degeneration.

c) Improving the egg nutritional value

With regards to the nutritional value of the eggs it is important to remark that eggs are an excellent source of high quality and easily digestible protein as well as a good source of certain vitamins and minerals (Table 1). Levels of most vitamins in eggs are directly linked to the levels in the diet of the hen. Layer feed conversion rates have improved dramatically (approx. 40%) during the last 30 years so that it is essential to re-evaluate vitamin levels in feed accordingly if we want to offer eggs to consumers with, at least, the same nutritional value than in the past.

Recent research (Pérez-Vendrell et al., 2004) has compared the effects of two vitamin levels in laying hen diets (average levels used by the Spanish egg industry versus Optimum Vitamin Nutrition (OVN) levels) on the vitamin deposition and quality of eggs. Results indicate that almost all vitamin levels (A, E, B1, B2, B12, pantothenic acid, folic acid, biotin) found in whole egg were statistically increased when hens were fed OVN premix (but not enough to be considered as vitamin enriched eggs), thus improving in that way the nutritive value compared to control eggs.
Table 1. Vitamin enriched eggs: current levels, R.D.A. (Recommended Daily Allowances in humans, Spain).

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Amount / egg</th>
<th>Amount / 2 eggs (100 g)</th>
<th>RDA</th>
<th>% of RDA in 100 g of egg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>96 µg</td>
<td>192 µg</td>
<td>800 µg</td>
<td>24</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>1.05 µg</td>
<td>2.1 µg</td>
<td>5 µg</td>
<td>42</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>0.96 mg</td>
<td>1.92 mg</td>
<td>10 mg</td>
<td>19</td>
</tr>
<tr>
<td>Vitamin B1</td>
<td></td>
<td></td>
<td>1.4 mg</td>
<td>0</td>
</tr>
<tr>
<td>Vitamin B2</td>
<td>0.20 mg</td>
<td>0.40 mg</td>
<td>1.6 mg</td>
<td>25</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td></td>
<td></td>
<td>2 mg</td>
<td>0</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>1.02 µg</td>
<td>2.04 µg</td>
<td>1 µg</td>
<td>204</td>
</tr>
<tr>
<td>Folic acid</td>
<td>15 µg</td>
<td>30 µg</td>
<td>200 µg</td>
<td>15</td>
</tr>
<tr>
<td>Niacin</td>
<td>2.04 mg</td>
<td>4.08 mg</td>
<td>18 mg</td>
<td>23</td>
</tr>
<tr>
<td>Biotin</td>
<td>12.12 µg</td>
<td>24.24 µg</td>
<td>150 µg</td>
<td>16</td>
</tr>
<tr>
<td>Calpan</td>
<td>6 mg</td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Vitamin C</td>
<td></td>
<td></td>
<td>60 mg</td>
<td>0</td>
</tr>
</tbody>
</table>

Most eggs produced nowadays contain a lower level of some vitamins compared to those levels published for eggs in the official nutritional tables. This fact is probably related to the improvement of layer feed conversion mentioned previously due mainly to better animal genetics and management compared to the past and the non-corresponding adaptation of vitamin levels in feed: the lower the vitamin intake by the hen, the lower the vitamin deposition in the egg. On the other hand, OVN eggs contained a higher level of those vitamins which allowed eggs to have a nutritional value similar or even better than the ones published in official nutritional tables.

Nutraceuticals such as vitamin enriched eggs are another way to increase their added value. Currently there are several brands in the market offering eggs enriched with vitamin A, E, Folic Acid, Biotin, etc as a way to balance the diet of certain segments of the human population such as pregnant women, children or elderly people. Egg producers must guarantee in these eggs a higher content of the enriched vitamin (min. +15% RDA, Recommended Daily Allowance for humans) compared to the average level of such vitamin in a standard egg.

Recent experiences have been run in France and the UK with laying hens fed a combination of vitamin D3 and its active metabolite, 25-hydroxyvitamin D3, added in the diet as HyD®. First results have shown the possibility of enriching eggs with vitamin D under EU conditions where there is a maximum vitamin D3 level of 3,000 IU in layer feed. By doing that the egg industry might contribute to the solution of an important need in human nutrition: the lack of enough vitamin D which is associated to an increase on the risk of osteoporotic fractures in older age groups and which is affecting a large proportion of Europeans (Ovesen, 2005).
REFERENCES


