

# Quality of foraging material and effect on hens feed intake, egg production and -quality



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In a project with organic egg laying hens, the effect of different kind of foraging material was studied on feed intake, egg-production and -quality.

Hens in organic egg production require daily access to foraging material e.g. different kinds of silages, grasses, carrots or other vegetables. Foraging material has positive effect on foraging behaviour and welfare,

and on development of the intestinal system and microflora. Foraging material constitute quantitatively a large part of the hens daily feed intake affecting the egg quality, depending on type of foraging material.

In the present study, laying hens had daily access to different silages and carrots. The chemical composition of the foraging material was analysed in order to evaluate the nutritional value and study the effect on different parameters.

## Experimental study

The study with organic hens was performed at the organic research facilities at DJF during 23 weeks (hen age 19-41 weeks). Two different genotypes were included (Lohmann Silver: LS and New Hampshire: NH), and three experimental diets (A, B and C) were fed to both genotypes together with either alfalfa silage (AS) or maize silage (MS) and carrots.

Diet A represented the organic feed used in practice with mainly imported protein sources. Diet B and

C were entirely based on Danish grown ingredients, including protein sources as soybeans and lupine. A, B and C contained 19.3%, 18.7% and 17.0% protein and 3.6g, 2.8g and 2.6g methionine/kg feed, respectively. From 2012, feed for organic egg production within the EU must be based 100% on organic ingredients. Inadequate supply of methionine (Met) can have negative effects on egg-production and -quality, so the demand for alternative protein sources is high.

## Foraging material and chemical composition

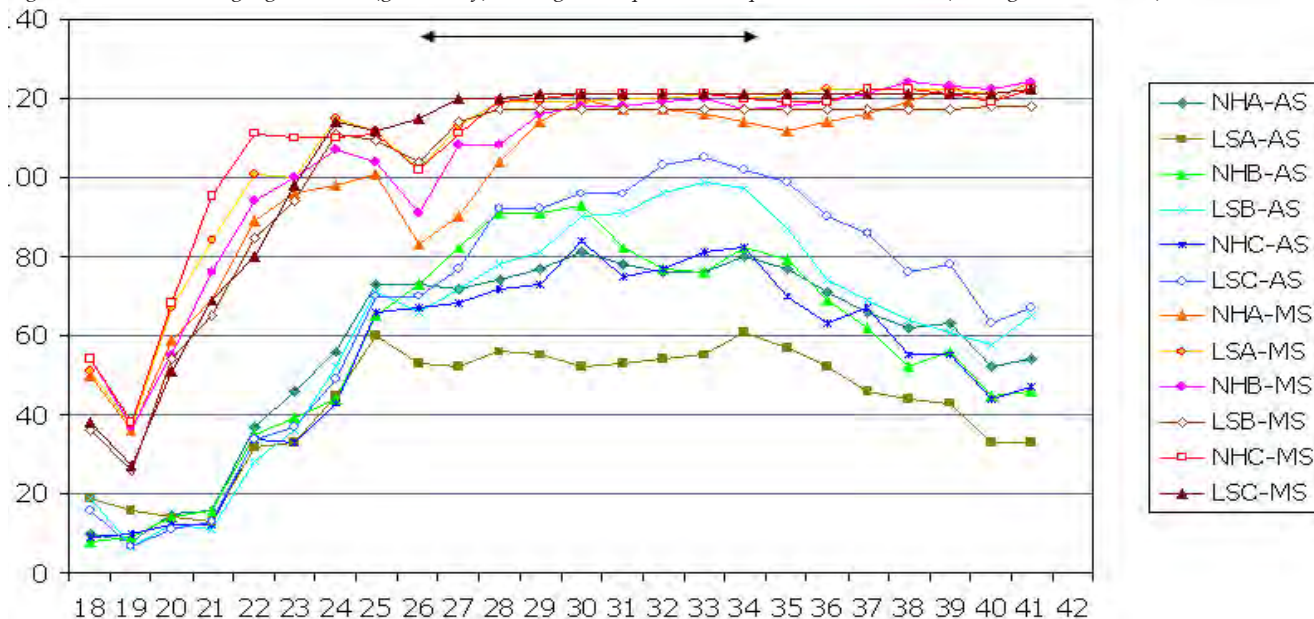
Analysis of the two silages and the carrots showed a large difference in chemical composition (Table 1). The content of protein and Met was highest in AS and lowest in MS and carrots. The total content of fibre

Table 1. Nutrients in silages and carrots

Nutrient	Alfalfa silage	Maize silage	Carrots
Drymatter	24,5	32,5	8,8
Protein	22,3	9,2	7,2
Methionine	2,5	1,5	< 1
Carbohydrates:			
Starch	< 1%	28,4	0
Cellulose	20,6	16,9	7,8
NCP	20,3	18,1	13,1
Total NSP	40,9	35,0	20,9
Lignin	10,5	7,7	1,2
Total fibre	51,4	42,7	22,1

Values given are in % of dry matter; methionine in g/kg dry matter (average of 2-5 batch). NCP: Non cellulosic polysaccharides. Total NSP = Cellulose + NCP. Total fibre = NSP + lignin

Figure 1 Intake of foraging material (g/hen/day) during the experimental period of 23 weeks (hen age 19-41 weeks).



NH = New Hampshire, LS = Lohmann Silver, A = diet A, B = diet B, C = diet C. AS = Alfalfa silage, MS = Maize silage + carrots. The arrow indicates the 10 week period where organic carrots were unavailable and the groups normally fed with both MS and carrots were fed MS only (see text).

was also highest in AS and lowest in carrots. The MS used in the present trial contained on average 28.4% starch, i.e. a fine quality with a high content of maize kernels, which contribute with energy to the hen.

**Intake of foraging material**

Groups given MS had a higher intake of silage than groups fed AS (Figure 1). Consumption of MS increased over time except in the 10 weeks mid summer, where organic carrots were unavailable. The hens needed a period to increase their intake of MS with higher fibre content. Intake of AS increased until the age of 34-35 weeks, where a dramatic drop in the consumption of AS was observed in

all groups. For both genotypes given diet C, the intake of AS was higher compared to hens fed either diet A or B. Probably the hens given diet C have increased their intake of AS to compensate for the lower protein and Met content in diet C.

On the contrary, the hens on diet A or B was not particularly interested in the AS. The AS used in the present study had a high fibre content (>50% of dry matter), which resulted in a poor quality silage in spite of the high Met content. This could also explain the higher daily intake of the diets by hens given AS (on average 120g diet/day/hen) compared to hens given MS and carrots (on average 108g diet/day/hen).

**Egg-production and quality**

Hen given AS had a higher egg-production, egg weight and total egg mass, compared to groups given MS and carrots (Table 2). This result can be caused by either a higher intake of diet C and/or additional contribution with amino acids from the AS due to a higher intake of AS in these groups.

The yolk colour was influenced by the specific foraging material used and hens given AS produced egg with darker and more reddish and yellow yolks, caused by the difference in content and composition of carotenoids between the silages and carrots. The carotenoid lutein is yellow, of which the egg yolk in general has a high content. The concentration of carotenoids in AS was 6-10 times higher than in MS.

**Perspectives**

The study shows that different kinds of foraging material can influence both egg-production and quality in organic egg production.

The composition of nutrients in the silages and carrots used in the present study was very different in content of protein, Met, starch and fibre. The particular batch of alfalfa silage

used had a high content of protein and Met, which could contribute with essential amino acids. Diets based entirely on 100% organic feed ingredients could limit the supply of especially Met. Unfortunately, the alfalfa silage was also high in fibre content.

The results imply the importance of using foraging material of a high quality and further studies on the quality of other types of silages or vegetables are relevant in order to obtain an optimal organic egg-production with a high egg quality.

Egg parameters	Alfalfa silage	Maize silage and carrots	P-value
Egg weight, g	57,1	55,9	< 0,001
Laying rate, %	79,3	75,9	< 0,001
Egg mass, g/hen/day	45,9	42,6	< 0,001
Shell strength, N	35,9	36,0	NS
Yolk colour, lightness	62,5	63,6	< 0,001
Yolk colour, redness	1,24	0,21	< 0,001
Yolk colour, yellowness	56,0	54,6	< 0,001
Albumen dry matter, %	12,89	12,9	NS
Albumen pH (48 hours)	8,96	8,98	NS

Table 2. Effect of using AS or MS and carrots on egg-production and quality (average for the period 21-41 weeks of age)

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[http://www.icrofs.dk/Sider/Forskning/foej0III\\_qemp.html](http://www.icrofs.dk/Sider/Forskning/foej0III_qemp.html)  
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