



## The JBL Koi Food Range

1. **Optimal Protein : Fat Ratio**
2. **Ideal Energy : Protein Ratio**
3. **Clear water !**
4. **Dermatologically tested**



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## The JBL Koi Food Range

What is the protein : fat ratio in **JBL NovoBel** and **JBL Gala** ?

	Protein	Crude fat	Crude fibre	Crude ash	Moisture	Protein	: Fat	Source
JBL NovoBel	43	8.3	1.9	8.1		5.2	: 1	Manufacturer
JBL Gala	45	8	2	9		5.6	: 1	Manufacturer

**Protein to fat ratio:  
5.2 – 5.6 :1**

**And in carp ?**



### JBL Koi midi

Koi pellets for medium-sized Koi (15 - 35 cm)

- Presentation and nutrient content tailored to the specific needs of medium-sized fast-growing Koi.
- Select protein carriers and appropriate fat content to ensure a balanced growth rate.
- 15 % Wheat germ content, fish protein and 4 % fish oil, as well as spirulina algae satisfy the specific nutrient needs of the fish.
- With adjusted protein-fat ratio of 4:1



## The JBL Koi Food Range

### JBL Koi mini

Koi pellets for young Koi (10 - 20 cm)



#### Type of product

Main food

#### Analytical components

Crude protein		40.50 %
Crude fat		10.50 %
Crude fibre		2.00 %
Crude ash		10.00 %

#### Crude protein

Is the sum of all of the compounds containing nitrogen. The content is usually ascertained by determining the nitrogen concentration of the sample first (e.g. by the Kjeldahl method). Afterwards, the result is multiplied by a factor that represents the reciprocal value of the typical N concentration in crude protein. This normally amounts to 6.25 (plant protein) or 6.38 (animal protein) – based on an average N concentration in crude protein of 16 % (plant) or 15.7 (animal). The proportion of crude protein that can actually be used is referred to as digestible crude protein (DCP).

#### Crude fat

The crude fat content is part of the food which dissolves in fat solvents such as petroleum ether. It is determined according to Soxhlet.

#### Crude fibre

"Crude fibre" refers to the proportion of a foodstuff that is left over as a "non-digestible" component after treatment with undiluted acids and lyes. Cellulose forms the main component of this substance class. Crude fibre cannot be equated with dietary fibres, since these are made up of only approx. one-third of cellulose and contain many other non-digestible components.

#### Crude ash

The crude ash content is determined by heating the sample until weight constancy and up to 550 °C in a muffle oven. As a result, all of the organic ingredients are muffled (burned) and the sediment is the crude ash content. This mostly comprises minerals and sand, depending on the sample. The value of the total mass of the food less the value of crude ash is the organic mass (OM). The organic mass consists of crude protein, crude fibre, crude fat and NfE (nitrogen-free extracts such as sugar, etc.)



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Adult carp primarily feed on worms, larvae, shell fish and crustaceans which they find by grubbing around in the bottom. They will occasionally eat aquatic plants as well. The larvae and juvenile fish predominantly feed on plankton and microorganisms.





## The JBL Koi Food Range

### 1. Assessment of the natural diet

As fry, carp in ponds start out by eating infusoria (protozoans = unicellular organisms) and wheel animals (rotifers) and then, later on, primarily feed on water fleas (daphnia). The population of water fleas decreases so drastically under the feeding pressure of carp that the food requirements of the fish can no longer be met in the summer.

When young carp reach a length of 2 cm, they also begin digging up small insect larvae (particularly red mosquito larvae, Chironomidae) and worms (Tubificinae) from the bottom of the pond. Their population may decrease so drastically in highly populated ponds that no more than 1-2 g/m<sup>2</sup> are left (according to Schreckenbach). The populations of water fleas, as well as those of the worms and insect larvae, are unable to recuperate from the feeding pressure of the carp.

In this respect, timely supplementary feeding with substitute foods is essential, as, otherwise, the animals will suffer growth disorders and their general condition will deteriorate in the summer. Due to their strong growth in summer water temperatures, even small koi carp population densities in ponds can decimate the natural food supply to such an extent that supplementary feeding is required in July and August.

Their natural diet consists of around 60 % protein, 30 % fat and 28 % chitin (in relation to the dry weight ).



Modified according to: K. Schreckenbach (2004)



## The JBL Koi Food Range

### 2. Supplementary feeding

Due to their strong growth, young carp require significant amounts of protein and fat. Storing reserves for the winter is also important for survival in the winter and rewarming in the spring. According to the literature, carp need a minimum of 7 MJ energy per kg of body weight to be ideally prepared to survive the winter (Schreckenbach 1993).

If the natural food in the pond decreases, supplementary feeding is indispensable for a satisfactory diet. Supplementary food can be assessed by comparing the nutrient composition of the food animals (approx. 60 % protein, 30 % fat and 28 % chitin in relation to the dry weight).

Correspondingly, optimal foods contain proteins, fats, vitamins and trace substances. Although merely feeding grain products supports energy metabolism, the protein contents are too low, so that protein deficiency may lead to growth disorders and fatty degeneration of the liver may occur.

The ratio of protein, fats and energy contents is also important when assessing supplementary foods. Food with a high protein content, but low fat content, causes the carp to burn proteins in their energy metabolism, thereby increasing the excretion of ammonium. This in turn leads to higher pH levels and more ammonium pollution, which can cause gill necroses in the fish (Schreckenbach & Spangenberg 1987).

Good supplementary foods have a balanced energy : protein ratio of approx. 0.4 MJ of digestible energy per % of crude protein. This produces healthy growth and improves the animal's overall condition, thereby increasing its resistance to diseases.

Modified according to: K. Schreckenbach (2004)





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Crude protein		40.50 %
Crude fat		10.50 %
Crude fibre		2.00 %
Crude ash		10.00 %

### JBL Koi midi

Koi pellets for medium-sized Koi (15 - 35 cm)

#### Type of product

Main food

#### Analytical components

Crude protein		38.00 %
Crude fat		9.50 %
Crude fibre		2.00 %
Crude ash		10.00 %

### JBL Koi maxi

Koi pellets for large Koi (over 30 cm)

#### Type of product

Main food

#### Analytical components

Crude protein		33.00 %
Crude fat		8.00 %
Crude fibre		3.00 %
Crude ash		10.00 %

### JBL Koi Energil midi /maxi

Vital winter food for large koi

#### Type of product

#### Analytical components

Crude protein		19.00 %
Crude fat		14.00 %
Crude fibre		1.50 %
Crude ash		6.00 %



## The JBL Koi Food Range

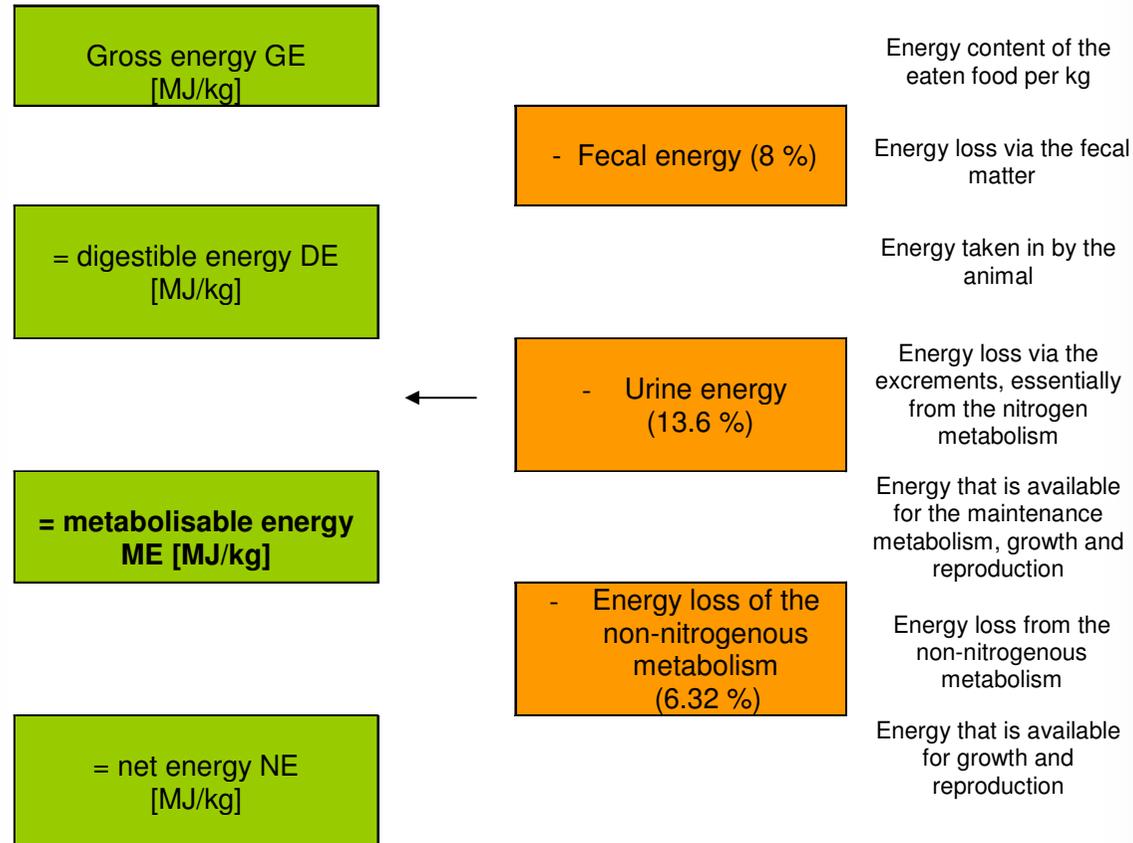
The **metabolisable energy** is calculated as follows:

The unit for energy is joule [J]

1,000 J = 1 kJ

1,000,000 J = 1 MJ

1 kcal = 4.186 kJ



The data regarding the losses is based on Ogino et al. (1976); Smith et al. (1978); Steffens (1985).



## The JBL Koi Food Range

### The metabolisable energy (ME)

According to Hoffmann and Schiemann (1980), the metabolisable energy (ME) is the maximum amount of energy available to an animal from the foods for maintenance metabolism and energy metabolism.

This scale for food assessment has the following advantages:

The assessment of energy can be checked in the animal by using feeding experiments and examining increases in energy. When energy is converted into net energy, heat losses occur which correlate with the weight gain (according to the concentration of proteins and fats). The heat losses depend on the food that the animals eat. In cold-blooded fish, though, the heat losses are largely negligible.

Extensive scientific results have been derived from commercial animal husbandry and breeding.

The metabolisable energy can be derived from an equation taken from the afore-mentioned sources and based on the formulation of the DLG food tables (1991), Steffens (1985) and other authors:

$$\text{ME [MJ]} = a \times \text{DCP} + b \times \text{DCF} + c \times \text{DCFi} + d \times \text{DNFE} - e \times \text{Su}$$

with

DCP – digestible crude protein (90 % in carp)

DCF – digestible crude fat (85 % in carp)

DCFi – digestible crude fibre (max. 14 % in carp)

DNFE – digestible phase of the non-nitrogenous compounds (83.52 % in carp)

SU – sugar

*a, b, c, d, e – correction factor (for more precise adjustment to different species)*

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## The JBL Koi Food Range

### Metabolisable energy (ME)

$$\text{ME [MJ]} = a \times \text{DCP} + b \times \text{DCF} + c \times \text{DCFi} + d \times \text{DNFE} - e \times \text{Su (per kg of dry weight)}$$

		JBL Koi mini	JBL Koi midi	JBL Koi Maxi	JBL Koi Energil	JBL Koi Delikat
<b>Protein to fat ratio:</b>		<b>3.86 : 1</b>	<b>4 : 1</b>	<b>4.1 : 1</b>	<b>1.36 : 1</b>	<b>1.89 : 1</b>
<b>Crude protein</b>	%	40.5	38	33	19	53
<b>Crude fat</b>	%	10.5	9.5	8	14	28
<b>Crude fibre</b>	%	2	2	3	1.5	3
<b>Crude ash</b>	%	10	10	10	6	4
<b>NfE (nitrogen-free organic substance)</b>	%	33.8	36.5	41.82	57.4	7.13
<b>Metabolisable energy ME</b>	MJ / Kg	16.06	15.64	15.12	16.29	20.40
<b>Metabolisable energy ME per % crude protein</b>	MJ / Kg	0.40	0.41	0.46	0.86	0.38
<b>Digestible energy to protein ratio</b>	(DE/P)	427	442	486	911	415

Foods with a **metabolisable energy of approx. 0.4 MJ per % of crude protein** and a **digestible energy to protein ratio (DE/P) between 410 and 490** are considered optimal as food for carp.



The foods, **JBL Koi mini**, **JBL Koi midi** and **JBL Koi maxi**, complied with both assessment parameters. The reduction of the protein content is decisive in the winter food, **JBL Koi Energil**, as the animals do not grow in the winter. Just the same, the fat content and NfE content (non-structural carbohydrates) must be increased in order to maintain the animals' energy metabolism, which is reflected by the energy : protein ratio of 911.



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### JBL Koi mini

Koi pellets for young Koi (10 - 20 cm)



- Novel pearl shapes ideally suits the size of mouth of young Koi.
- The ingredients satisfy the needs of growing-up Koi, due to essential substances, energy carriers, and vitamins. High vitamin content to ensure that the immunological system is developed.
- Well-balanced percentage of constituents of animal and vegetable origins.
- With adjusted protein-fat ratio of 4:1

### JBL Koi midi

Koi pellets for medium-sized Koi (15 - 35 cm)



- Presentation and nutrient content tailored to the specific needs of medium-sized fast-growing Koi.
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- 15 % Wheat germ content, fish protein and 4 % fish oil, as well as spirulina algae satisfy the specific nutrient needs of the fish.
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### JBL Koi maxi

Koi pellets for large Koi (over 30 cm)



- High-grade food pearls with 10 % high-protein spirulina algae.
- Unsaturated fatty acids and carotenoids yield well-balanced growth and brilliant colours.
- Essential vitamins and balanced vitamin C enhance the resistance to diseases.
- With adjusted protein-fat ratio of 4:1

### JBL Koi Energil midi /maxi

Vital winter food for large koi



- 2 grain sizes: Midi = 3 - 4 mm (40306), Maxi = 5 - 6 mm (41007).
- Premium food for small to medium-sized koi at temperatures below 15°C
- Sinking sticks, because koi withdraw into deeper water when temperatures drop
- Vital for the prevention of typical spring diseases
- High energy content in the form of 10 % fish oil with valuable omega 3 ensures survival of fish in the winter



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<b>Cereals</b>	%	23.3	19.7	35.4	40.4	
<b>Fish products, fish by-products</b>	%	18.7	16	11.8	8.9	
<b>Plant by-products</b>	%	16.6	13.6	14	33.7	
<b>Vegetables</b>	%	15	9.8			
<b>Oils, fats</b>	%	5.9	9.8	2.9	9.9	
<b>Molluscs / crustaceans</b>	%	7	13.4	9.8	6.7	
<b>Algae</b>	%	9.3	9	9.8		
<b>Vegetable protein extracts</b>	%		4.5			
<b>Yeasts</b>	%	2.3	2.2	2.5		
<b>Insects</b>	%					100
<b>Miscellaneous</b>	%	1.9	2	13.8	0.4	
<b>Sums</b>		100	100	100	100	100

If the animals are not fed supplementary foods in time, growth disorders and deficiencies in their general condition may occur in summer temperatures.





## The JBL Koi Food Range - Literature

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# JBL

The JBL Koi food range - a long and healthy life for your fish

