

Tetra Pond

Koi Nutrition



Curly peppermint

For more information: www.tetra.net



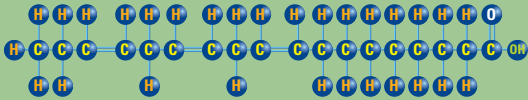
The essentials for a balanced diet

For optimum health, koi require a balanced supply of nutrients in their diet. During digestion these nutrients are broken down into their constituent molecules, which are then absorbed and used for all living processes, for example to provide energy or build new tissues. Energy is needed for all processes, such as powering the chemical reactions involved in building new tissues, maintaining the internal salt and water balance (osmoregulation), processing food, respiring, reproduction and swimming.





Unsaturated Fatty Acids



Linolenic acid (18:3n-3):

- 18 = number of carbon atoms
- 3 = number of double bonds
- n-3 = position of first double bond

The key nutrients include:

Proteins

Proteins are made up of component amino acids, which are used to build new tissues and enzymes or can be used to provide energy. However, it is undesirable for protein to be used as an energy source, as this results in higher ammonia excretion, bad growth and poor condition. This is because ammonia is the main waste product from protein metabolism. A diet with the correct balance of protein and energy will limit its use as an energy source and ensure good condition. Protein quality is very important and different ingredients contain different qualities of protein. For example, there are 10 'essential' amino acids that must be included in diets for koi. If they are of a good quality, high protein foods will encourage faster growth rates in fish.

Essential Amino Acid	Requirement (% of dietary protein)
Arginine	3.8 – 4.3
Histidine	1.4 – 2.1
Isoleucine	2.3 – 2.5
Leucine	3.3 – 4.1
Lysine	5.3 – 5.7
Methionine	1.6 – 3.1
Phenylalanine	4.9 – 6.5
Threonine	3.3 – 3.9
Tryptophan	0.3 – 0.8
Valine	2.9 – 3.6

Carbohydrates

Carbohydrates are primarily used as an energy source by fish (containing around 17.2kJ gross energy per gram), although many species are limited in their ability to use them. Koi are better at using carbohydrate than most fish species, as they possess high levels of special enzymes (amylases) that are used to break them down. Therefore, some carbohydrates of good quality and in balanced quantities in a koi diet provide a useful supply of energy. Too much, or the 'wrong' type of carbohydrates will cause problems such as damage to the liver.

Lipids

Lipids (oils and fats) are the primary and best source of energy for fish (containing 39.5kJ gross energy per gram), as well as being important components of cell membranes, and essential for different metabolic processes. Just like proteins, lipids vary in quality depending on the fatty acids they contain. Koi require certain unsaturated fatty acids (e.g. omega-3 fatty acids) for optimum health and condition, and these must be provided in the diet. It's very important that koi receive the correct quality and quantity, and the correct ratio of lipids to proteins and carbohydrates. Low quality lipids will reduce the cost of the diet, but they are not available for koi to use efficiently, leading to poor condition. It is therefore vital to use a good quality diet, such as **KoiExcellence**, which contains the right type and quantity of lipid.

Vitamins

Vitamins are organic molecules that are required in small amounts in the diet. They are essential for most metabolic reactions, and their deficiency or poor bio-availability results in poor growth and condition, as well as diseases. For example, there are some types of stabilised vitamin C that are less biologically available to fish. Vitamins are classed as either water soluble (e.g. vitamin C and the B-group vitamins) or fat soluble (e.g. vitamins A, D, E and K). The stability of vitamins in the diet is affected by external factors such as light, oxidation, moisture, heat, and storage time. Food that is incorrectly stored, for example if it is exposed to light, will lose its vitamin content more rapidly. In addition, vitamins may be chemically altered rendering them unavailable to the fish.

Minerals

Minerals are inorganic substances that are required for many metabolic processes, as well as forming a key part of structural elements such as bone. Koi can obtain some of their mineral requirement from the surrounding water, but the rest must be provided in their diet. Minerals are divided into two groups – major and trace minerals. Major minerals, such as calcium, phosphorus and magnesium, are required in large quantities, whereas trace minerals such as iron and manganese are only needed in small amounts.

The ingredients used to make a fish food and the methods used to process them affect the nutrient quality and composition of the final diet. **Tetra KoiExcellence** has been carefully formulated and manufactured to provide koi with a well balanced supply of energy and nutrients to ensure healthy growth and good condition, with minimal waste production.

Feed efficiency & water quality

Unlike fish in natural environments, koi kept in ponds are held in smaller volumes of water where waste can accumulate rapidly. A major source of both dissolved and solid waste in a pond is the food that is fed to the fish.

Solid waste is mainly faeces, which is principally composed of undigested food. A certain amount of undigested food is to be expected, due to the presence of fibre. A limited amount of fibre (2-5%) is beneficial for aiding digestion. However, excess undigested food suggests a poorly formulated or manufactured diet. It affects water quality by clouding the water, consuming oxygen and leaching dissolved waste such as phosphate and ammonia.



The key dissolved waste produced directly by fish is ammonia, which is primarily excreted across the gills. Ammonia is the main waste product of protein metabolism. In a pond with a properly functioning filter system, ammonia is oxidised to nitrate (via nitrite) by nitrifying filter bacteria.

High levels of waste are not only detrimental to water quality, and ultimately fish health, but they also increase the amount of maintenance needed to keep the pond healthy. This is because solid waste accumulates on the base of the pond or clogs the filter system, whilst dissolved wastes (especially nitrate and phosphate) encourage algae to grow.

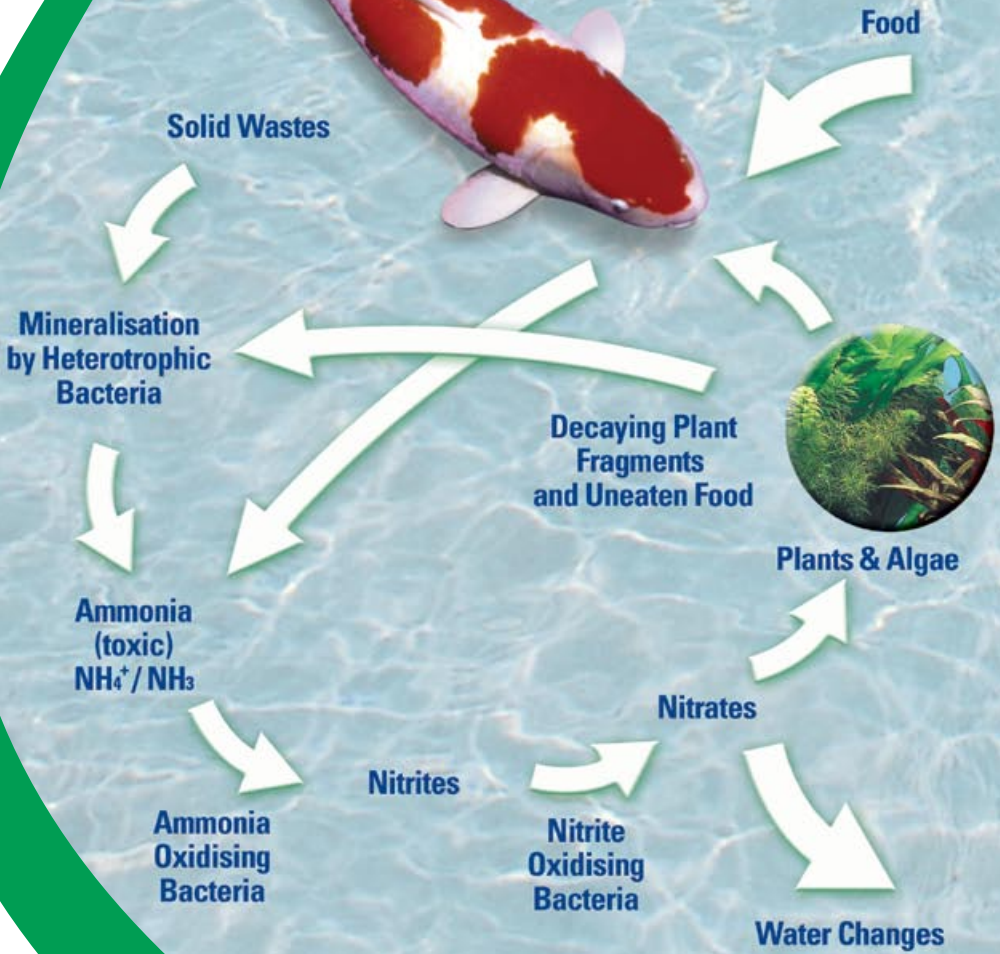
The digestibility and formula of a food affects the quantity and type of waste the fish produces and so it is very important to feed good quality diets to your koi. Poorly digested and formulated diets will not be used as efficiently by your koi and will lead to a faster accumulation of solid and/or dissolved wastes. This is why cheaper diets are often a false economy, as more needs to be fed to deliver the same nutrition and their use results in extra waste production.

Tetra KoiExcellence diets are formulated to be used extremely efficiently by koi, resulting in minimal waste production, as well as good condition, colour and health.

This is due to the use of high quality ingredients, the correct balance of nutrients, and state-of-the-art extrusion manufacturing processes. This makes it easier to maintain good water quality and clarity, as well as keeping maintenance to a minimum. It also means that your koi receive maximum nutrition, for good growth and condition.



Nitrogen Cycle



Koi health & ActiveFormula

The diet you feed to your koi can affect the strength of its immune system and therefore its ability to resist common infections. Certain ingredients, plus a balance of nutrients and energy, are essential for a healthy immune system.

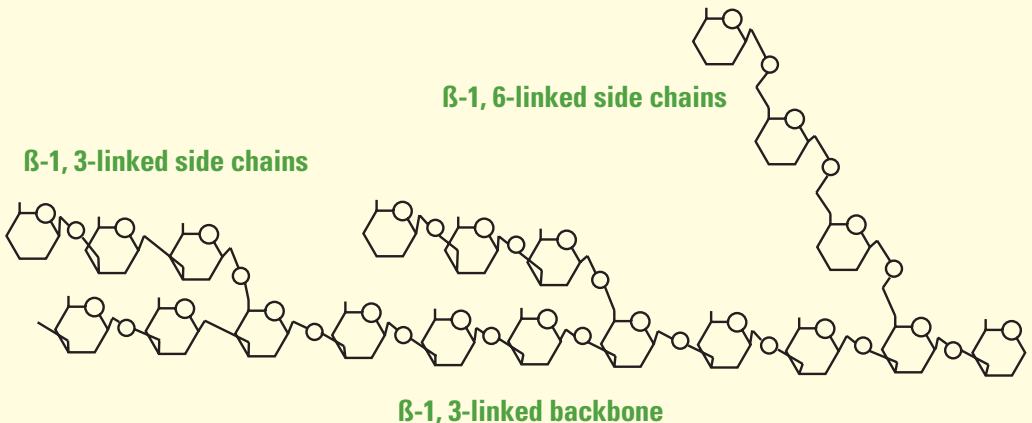
ActiveFormula contains a patented combination of ingredients, included in **Tetra KoiExcellence** to support the immune system of koi.

ActiveFormula works by supporting the activity of macrophages, types of white blood cells that form an important component of the non-specific immune system. One component of ActiveFormula, β -glucan, is especially good at this. The type of β -glucan used is also important, with β -glucan 1,3/1,6 (referring to its chemical structure) being most effective.

This, coupled with vitamins (including additional biotin) and highly unsaturated fatty acids, makes ActiveFormula especially good at supporting the immune system and your koi's natural ability to resist infections.



Beta Glucan Structure



Acceptability

To gain maximum nutrition from a food, it is important that it is acceptable to koi and therefore eaten quickly. The acceptability of a food can depend on a number of factors, including appearance, texture and smell/taste. For example, certain amino acids are especially palatable to koi.

A food that softens quickly also improves acceptance, as it is easier for koi to consume it. If food is not well accepted and is allowed to spend time in the water before it is consumed, it will leach certain nutrients (especially vitamins) into the water. This will decrease its nutritional value.



Tetra KoiExcellence is formulated to be highly palatable for koi, as well as soften quickly on entering the water. This is possible because of the extrusion process used to make the diet. This way the food can be consumed quickly and easily, ensuring it retains its nutritional value. **Tetra KoiExcellence** does not therefore need to be soaked before use like some koi foods.

Colouration

While the patterns and colours of your koi ultimately depend on genetics, their intensity and quality is greatly influenced by diet. The condition of the fish and environmental factors also exert an influence on their colouration.

It is therefore important to provide koi with a source of colour enhancing ingredients in their diet, such as carotenoids. Suitable ingredients include Spirulina, shrimps and certain plants. **Tetra KoiExcellence** diets contain the correct level of carotenoids for ensuring the best colouration of your koi.

KoiExcellence foods are designed to promote good colouration without tainting the white areas of the skin.

KoiExcellence Complete contains limited levels of carotenoids to maintain colour, whereas **KoiExcellence Performance** has higher levels of carotenoids and will rapidly optimise the colour of your fish.



Seasonal Feeding

The amount and type of food that your koi needs depends on the temperature of the water. This is because koi, like most other fish, are ectothermic ('cold blooded'). In other words, their metabolism is governed by their surrounding temperature. For example, the resting

oxygen consumption of koi may increase from around 17mg/kg/hr at 10°C, to 48mg/kg/hr at 20°C.

Oxygen consumption rates of koi in ponds may be even higher than this due to feeding and higher levels of activity.

Summer feeding

At higher temperatures, koi have a greater energy requirement, as well as an increased capacity to turn dietary nutrients into new growth. This means they need to consume more food in the summer and will grow faster if given an appropriate diet. **Tetra KoiExcellence Performance** provides koi with a more nutrient and energy-rich diet, to allow them to fulfil their growth potential. Because it contains more nutrients and energy, additional growth can be achieved without having to feed an excessive volume of food. This helps to keep waste production low and is preferable to feeding a staple food at this time of year.



Winter feeding

As temperatures fall during the autumn and winter, the amount of food that your koi require will decrease. Often it is only necessary to feed them once every day or two to meet their energy demands. However, it is essential to keep feeding them if they are active, as otherwise they will not be able to replace the energy they burn. Koi that are not fed during the winter are often weaker in the spring and when temperatures increase they are more vulnerable to infection.





It is also very important to feed your koi well in the last few weeks of warm weather, to ensure they have good energy reserves for the cold months. **KoiExcellence Complete** or **Performance** provide koi with readily available body reserves, which put them in excellent condition for the winter. Likewise, they should be fed well in early Spring (before temperatures reach 10°C) because they require nutrients as soon as possible to rebuild energy reserves lost over the winter. **KoiExcellence Wheatgerm** is ideal for this.

Once temperatures fall to 10°C or below, it is important to feed a specially formulated winter food to your koi. These foods are more digestible at lower temperatures, and provide koi with important energy and nutrients to keep them healthy through the colder weather. In particular, diets like **Tetra KoiExcellence Wheatgerm** contain high levels of wheatgerm. Wheatgerm is a highly digestible ingredient, especially at lower temperatures. In addition it contains a good level of essential amino acids, vitamin E, and B-vitamins. **KoiExcellence Wheatgerm**

contains high levels of wheatgerm (23%) and should be fed to koi through the colder months. Koi should be fed as and when they are active and looking for food. If they are inactive, do not feed them.



Unlike many other koi foods, **Tetra KoiExcellence Wheatgerm** contains high levels of protein and energy. This is important, as koi will be fed infrequently and in much smaller quantities during the winter. It therefore ensures that they remain in good condition, even when fed at a much reduced level. It also ensures that koi will have sufficient reserves during periods when they are not feeding.



Storing koi food

It is important to store koi food correctly in order to get the most out of it. A number of factors can accelerate nutrient loss or contamination of fish food. These include light, moisture, oxygen, and heat. It is therefore important to store your koi food in a cool, dark, dry area if possible. It is also important to re-seal the bag / container each time you use it. **Tetra KoiExcellence** is packaged in re-sealable foil bags, to aid storage and freshness. In addition, they are opaque in order to prevent light from degrading the vitamin content of the food.

Once opened, we recommend using any koi food within a few months. This is because once opened, moisture and air will accelerate the breakdown of nutrients. You should therefore buy a pack size that will roughly last you for this length of time. To help you do this, **Tetra KoiExcellence** foods are available in three different sizes (2.5 litre, 10 litre and 25 litre).

If food becomes damp it should be discarded, as otherwise it can become contaminated with toxic fungi.

How much to feed

A Koi's requirement for nutrients and energy depends on the temperature of the water. In the summer they therefore need more food, in the winter less. By feeding 2–3 times a day, as much as they can eat in a few minutes, your Koi can get the nutrition they need at that particular time.

Tetra KoiExcellence diets



Because the food you feed has such an effect on the health of your koi and their environment, it is essential to use a good quality brand. Tetra has over 55 years' experience in researching and developing foods for ornamental fish and in this time we have developed an extensive knowledge of the nutritional requirements of koi. **Tetra KoiExcellence** benefits from research carried out both within our independently

accredited laboratories, as well as with external universities and institutes. In addition, it is produced using state-of-the-art manufacturing technologies and benefits from the use of only the highest quality ingredients. Add this to our careful quality control process (ISO9001 certified), which involves chemical analysis and feeding tests on each batch produced, and you have a food of exceptional quality. By choosing **KoiExcellence** you are guaranteed the following:

- Complete and balanced nutrition for your koi, leading to optimal health, colour and condition.
- ActiveFormula for healthy disease resistance
- Low waste production, thereby helping to maintain good water quality and clarity and keeping maintenance to a minimum.
- Choice of diets to meet all of your koi's nutritional requirements throughout the year.



Tetra KoiExcellence range



**For Koi up to 30-40cm
Pellets 3-4mm**
Available in 700g & 2800g



**For Koi over 30-40cm
Pellets 8-10mm**
Available in 500g, 2200g & 5500g

Tetra KoiExcellence Complete is a premium daily diet that can be fed for most of the year (down to 10°C). It contains controlled levels of carotenoids, to maintain colour without tainting the white areas of your koi. It should be fed 2-3 times a day, as much as your koi can consume within a few minutes.



Tetra KoiExcellence Performance contains additional levels of high quality proteins and energy, for improving growth rates. It also contains high levels of carotenoids, for quickly optimizing colour without tainting the white areas of your koi. It is an ideal summer food, and should be fed 2-3 times a day, as much as your fish can eat within a few minutes.



**For Koi up to 30-40cm
Pellets 3-4mm**
Available in 700g & 2800g



**For Koi over 30-40cm
Pellets 8-10mm**
Available in 500g, 2000g & 5000g



**For Koi up to 30-40cm
Pellets 3-4mm**
Available in 700g & 2800g



**For Koi over 30-40cm
Pellets 8-10mm**
Available in 650g, 2600g & 6500g

Tetra KoiExcellence Wheatgerm contains high levels of wheatgerm and is a premium diet for keeping koi healthy during the colder periods of the year (below 10°C). It should be fed once a day at cold temperatures, only as much as the fish can consume within a few minutes.





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