



Seminar Up-date

Here are some of the update items:

The AKCA board approved our budget and so we are start up again. On Wednesday, August 23, 2007, we had a conference call with all of the Committee chairs to get everybody on the same page. In addition, here is a list of the current speakers that we have lined up for the conference.

Art of Koi by Patty McGee

Nick St Erne

History of Koi Pins -Norm Call

America Koi, the Next Generation - Matt

Koi Breeding in the USA

How to put on a Koi Show or Steal other people ideas.

Pin Trading

KHV- Where are we at?

AKCA Judging

Wet Labs

Fantastic Ponds of Phoenix Pond Tour

Diamondbacks Baseball (if they have a game)

Tour of the Grand Canyon

Tour of Phoenix Area

Vendor Area

AKCA Awards Dinner



SAKA August Meeting

Education

Mini Topic:

Pronunciation

Classification: Snake

Main Topic: (August topic)

What should I feed my Koi

Food Glorious Food

By Gerry Preston reprinted from [Nishikigoi International Magazine](http://www.nishikigoi.com)

Well, that is how the song goes, but is it all so glorious? Strange as it may seem, the reasons why Koi Keepers feed their fish in the first place varies greatly; what the fish might need or want usually being pretty low on the list of priorities. Much more likely, will a particular brand or ingredient make those 'lack luster reds' deep and shine like a newly painted pillar box; or will those 'sure fire' minuscule Tategoi become champion biggies in just a few short months? So why do we choose one particular brand over another? Believe it or not, advertising influences all of us. As such, advertising generally falls into two clear divisions - the informative and the persuasive. Fish food producers, particularly on the ornamental side, spend a great deal of money on fancy packaging and persuasive advertising. Highly paid copywriters are employed to dream up alluring blurb such as 'protein rich', 'highly nutritious', or 'easily digestible' and, in some cases, this may be so. However, first and foremost it is about enticing us to part with our money by telling us all the things we want to hear. Sadly, useful information is often lacking on the pretext that the buying public would not understand it even if given. My inclination is to interpret this as, were we more learned or given comprehensive



information, we might not be enticed into buying something just for the picture on the packet! Just how useful, therefore, is the information given on a packet of fish food? Perhaps before we can attempt to answer that we also need to address the understanding issue. Leaving aside the often-effusive content of the marketing ploy, what is on the packet is usually the best we can expect to see. Many have a closed formula, thus are very minimal in what they tell us. Others, perhaps in the hope that we will think more is better, claim the inclusion of almost every ingredient known in their food. Some will simply give percentages of all, or just a few, of the major nutrients and that is all we have to go on.

Price, not surprisingly, is the other major factor in the equation. Market research, itself very costly, largely determines the 'sell price' - this is the point just below which there might be product resistance. Conversely, make a food too cheap and everyone thinks it cannot be any good and, therefore, will resist buying it for that reason! For sure, no manufacturer is going to put in a more expensive ingredient than he has to, even though this is highly unlikely to take the price beyond the expected profit level. Of one thing, we can be reasonably certain, the product price has little to do with ingredient price. Of course, some will argue that, quite rightly, Koi Keepers expect attractive packaging. Then there is production, handling, and transport cost, particularly with goods of foreign origin. There is also an unknown, to us, number of middle merchants before the product finally ends up with a very substantial mark-up in the retail outlet. In spite of all this, every year sees new contenders rushing to enter what, to most of us, already appears to be an over crowded market - each making new claims that their food alone contains the magic ingredients and additives that make it superior to all else, yet offering no independent proof of this whatsoever.

Thus returning to our labeling: as already stated, this is often limited to percentage of protein, oil, fiber, moisture and ash. There may also be some vitamin advice stated in weight or international units. The other major nutrient is carbohydrate. Since this is often the largest component in the formulation, I find its omission suspect. However, providing one is aware it will be present; we can usually deduce the percentage by subtraction. Although it is beyond the scope of this article to detail the biochemical make up of the numerous ingredients most likely used in fish feeds, perhaps a precise combined with defining the percentages will suffice. Those specified by the manufacturer will vary from brand to brand as will the number of individual percentages given, some being confined to just protein and oil. Since these all seem to be infinitely variable between brands, and often within the same brand, we already have a contradiction, which begs the question which one is best?

Protein

A major player and vitally important to the well being and growth of all living organisms. However, protein is just a collective word to describe the sum of its structural components, which are the amino acids. There are 10

essential amino acids needed and the same number that, when necessary, the fish can manufacture, and are thus termed nonessential. Of great importance is the amino acid, I) profile, meaning the fish need the 10 essential amino acids in differing proportions. Just as important, the ratio required vary to a greater or lesser extent from fish to fish, or indeed from animal to animal. Thus, the required amino acid profile of an outright fish eater such as pike would be quite different from a herbivorous fish such as roach. Carp are classed as; omnivorous, suggesting they eat a wide range of foodstuffs to include some of vegetable and some of animal origins. After digestion by the fish, consumed protein is reduced once again to amino acids that can either be used to build muscle or, wastefully, further broken down for energy. It is only when the balance of amino acids in the diet is optimal that there is the necessary anabolism to produce efficient protein synthesis and, therefore, growth; yet even then there still 7- 10% indigestible protein. Fortunately, the amino acid requirement for carp is reasonably well defined, and has little tolerance outside that definition. In other words, if any one of the essential-amino acids is only available at under the proportional requirement to its neighbors, then use-f the others will be to that first limiting amino acid, and the excessive discharged to waste. This unnecessary breakdown produces catabolism and -possible fat deposition. Most of all it produces a high " ammonia load and is, inevitably, bad for water quality. It will also compromise growth-rate and, if continued long enough, could have a detrimental effect on health status. Methionine is usually the first limiting amino acid in many natural proteins and this plus cystine, which can reduce the methionine demand, is often supplemented to a quality food. If the packet would generally boldly state this. We can now already see that a protein declaration is not telling us the entire story, and certainly gives no indication whatsoever of its suitability for our fish; neither is the protein percentage figure itself much help. The classification of proteins is largely of animal or vegetable origins. The amino acids contained in many fishmeal proteins match well to the profile requirement of carp. As such, their inclusion is generally a prerequisite to formulating a nutritious diet. The problem to the manufacturer is that they are expensive, particularly the very high quality white. Meals derived from Alaskan Pollack or similar fish often used in Koi foods. The use of the much-valued oily herring meal tends to be more in diets for Peruvian anchovy, is regarded, as second best but a proportion can be included without too many problems. In the early days of fish farming, it was common for the inclusion of bovine proteins in feeds. This practice reduced over the years and since the advent of B.S.E. is now very much frowned upon when included in rations for fish destined for human consumption!

Vegetable proteins are mostly poorly digested and many have a miss-match to be no accredited requirements - a low chemical score when measured against the ideal. However, some do have an excellent biological value in their own right and mixing with fishmeal proteins brings down the cost of the total protein expenditure. Soya bean is probably the most



widely used for dilution but is lacking in several essential amino acids, thus its inclusion above a certain level, although attractive commercially, is undesirable. It also contains natural feeding deterrents. Heating largely overcomes this problem with the addition of chemo-palantans; thereby persuading the fish to eat what its instincts would, almost certainly, make it refuse. The addition of attractors to stimulate a fish's appetite is nothing new. Izzack Walton added honey to his baits to catch carp three hundred years ago. Carp have very well developed gustatory (taste) and olfactory (smell) senses. Present day carp anglers have a seemingly unlimited array of flavors, extracts, and oils from which to choose. Many claim even the amino acids themselves to be attractors. Betaine HCl is probably the most used stimulator in baits and commercial feeds. However, should they do so, it is highly unlikely that many ornamental fish food producers would admit to using chemical palatability enhancers to make their product more acceptable.

With the ever shrinking bounty from the seas, seeking alternatives to fish proteins is essential, of that there is little doubt. The inclusion of dairy shows much promise. Perhaps the genus *Scenedesmus*, having a crude protein value of 55%, more than most and *SpIrulinae* could have considerably more value as a protein source than its over-hyped powers of color improvement. However, trials tend to confirm a reduction in growth as the percentages of these alternatives increase with a corresponding decrease in the fishmeal. Increasing the percentages further leads to heavy losses. A notable exception, however, is krill, (*Euphausia superba*); these tiny shrimp like creatures abound in massive quantities in the Antarctic and are expected to make a considerable contribution to future livestock feedstuffs. They have long been readily available to the aquarist. Coincidentally, of course, the much-heralded inclusion of chitin in some Japanese Koi foods sits nicely with the Japanese peoples fondness for consuming enormous quantities of crustaceans and shellfish!

Wheat germ meal is another protein source well exploited by the ornamental fish food industry. Whether it is even remotely possible to justify all the hype, is impossible to say. Never have I seen independent, or otherwise, trial results published appertaining to growth, health, or anything else. For years Koi scribes have played safe and just repeated everybody else - and eventually themselves -over and over again. Throughout the summer and winter. Personally, if Koi cannot properly utilize food due to temperatures being too low I can see little point in feeding them at all. On the other hand, if you are going to feed, it makes much more sense to use a good quality high protein food all year round, but especially in the traditional slowing down and warming up period. At these lower temperatures Koi are going to eat greatly reduced quantities anyway. Therefore, even with a high percentage protein feed, their actual intake of protein is very modest. One only has to examine briefly the sequential events in a natural body of water to realize the validity of this. In high summer, there is a profusion of plant growth as well as a multitude of insects and organisms that we can loosely term

animal. Nature thus satisfies herbivores, omnivores, and even carnivores. Carp undoubtedly consume large quantities of easily available plant life at summer temperatures. Duckweed is a particular favorite and Koi will make short work of any efforts to try to establish water lilies etc, in an existing pond. Contrast this with the depths of winter when virtually all of the higher forms of animal life, so relished by carp in summer, are still available to them in winter should they wish to feed; yet all of the plant life has completely died away - hasn't it? Koi literature is constantly stating the value of wheat germ revolves around being easily digestible and is, therefore, the ideal low temperature food. Even assuming that is true; the actual percentage of wheat germ in the food is very small indeed. Thus begs the question, how digestible is the rest of the food? Not very much is the easy answer, and probably a good job too since the major proportion will be carbohydrates. The universal use of carbohydrate is as a binder, to bulk out a feed, and as a cheap energy source. As carp's energy requirements in cold water are very minimal, if these feeds really were highly digestible, much of it would be retained as saturated (solid) fats within the body cavities and internal organs of the fish. In practice most of it simply passes through with little absorption into the blood stream. It probably does no more harm than it does any good! What it does do is to keep the cash registers ringing and the hobbyist content in the belief that they are providing quality food.

Quality and Quantity

Thus returning to the protein in dry diets, it becomes clear that separating quantity and quality is not so easy. A particular pellet having a high claimed protein percentage may well have a large amount of plant proteins in its inclusion. We have no control over this and little hope of identifying the good from the not so good, even when given a long list of ingredients. However, quantity is something tangible and it is very noticeable within the same brand that the higher the protein percentage the higher the cost. So is it okay, or more economical, to feed the cheaper lower protein food? Think of it like this: Koi have a daily quantity protein requirement governed largely by temperature and their size. Should that requirement not be met they certainly will not grow and could have trouble repairing damaged tissue, laying down eggs, etc. In fact, most of the functions needed to maintain a fish in good health. Now to keep the myths simple, supposing two Koi Keepers were to each feed 100gm of pellets a day, but M10% protein and the other very with a 30% protein. We can see instantly that the former gives as a daily protein intake of 40gm and the latter only 30gm of the same. Also, supposing the 40gm was the correct daily intake, then in order for the lower protein pellets to meet that requirement, the actual quantity of pellets would have to increase from 100gm to nearly 135gm Although this is probably better than not meeting the 40gm protein requirement, it could well make the cost of feeding a cheaper food more expensive. In addition, satiation may be exceeded long before consumption of the required protein quantity. In addition, there is the possibility that the resulting excess of other nutrients could have a



detrimental effect on the health of the fish. For certain, it will have a detrimental effect on water quality, particularly with increased suspended solids. Unfortunately, many Koi Keepers feed a quantity of food totally unrelated to protein content! Feeding Koi with bread, barley, corn, etc., in the belief, quite reasonably, exacerbates this that the fish enjoy a change. Such foods, although well accepted, are very low in proteins and being of vegetable origin have a poor biological value. Therefore, it is only if the Hess supplements are used as well as a high quality protein pellet food, is there a wide enough margin to compensate and maintain adequate daily protein levels. Although the overall cost of a high percentage protein food will increase, it should not do so proportionally as the percentage of other ingredients, obviously, would have reduced. However, it is certainly gratifying to me after campaigning for so long that Koi foods are generally too low in protein, that many producers now offer a range of foods with increased protein content - usually described as high growth food.

Growth

I suspect that the long held view that carp do not need high protein arose from carp farming traditionally being extensive - the fish getting most their nutrition from natural food in the pond. Daphnia (water fleas) have a protein content of between 48% to 50%, Gammarus (shrimp) 45% to 52% and Chintroniidae (bloodworms) as high as 55%. Thus, it was perfectly reasonable to supplement with bulky low cost foodstuffs, causing only modest dilution of the readily available protein rich feeding. A bio-filtered Koi pond has very little in common with these conditions and is indeed, in every sense, very intensive. Consequently, with natural feeding being virtually non-existent Koi, ideally, need foods of an exceptionally high biological value.

Additionally, I am afraid we cannot separate growth from temperature. As my own trials have shown (NI Winter 96/97), it is possible to achieve phenomenal growth using very high protein foods combined with consistently high water temperatures. Unheated Koi ponds are very different. Unless the water is sufficiently warm, the fish simply cannot consume enough food to grow at their full potential. Even more reason to feed to a maximum during the normal growing season providing, of course, the filter is able to cope with this, and to feed what makes them grow protein. There have been many studies to find optimum nutrient levels, but with most arrived at by considering the economics, If an additional 5% protein costs, say, 10% more for only a 2% increase in growth-rate, some might not consider that economical. Koi Keepers rarely worry about such restraints and most will happily pay more for only a modest return. However, many authorities seem to concur with around 38% protein as a minimum. I would add, especially if also regularly giving any legume or pulse feeds, 40% plus would be even better and just hope you have bought good quality protein in your chosen brand of food. Certainly if growing on small fish separately, then nearer to 50% protein would show a marked benefit in size and shape of the fish. Last but by no means least, it is quite feasible to reduce the feeding quantity by giving a high protein diet. The benefits

are soon obvious. It encourages fish to clear up everything you offer the fish, but you still are meeting their essential needs. Also, realize that most recalculating systems are far better able to cope with increasing ammonia loads than they are of solids, which tend to inhibit nitrification. Thus by simply upping protein levels makes for a cleaner pond and healthier fish.

Nutrition: Getting Ready for Winter

By Art Lembke

Over 75 degrees:

- a) Getting ready for winter starts in early summer
- b) Feed 5-6 times per day with pellets
- c) Protein content of pellets should be 35% or more
 - 1. If you have a smaller pond and do not wish to have large Koi, feed spirulina pellet all the time
 - 2. If you want large Koi, do not feed spirulina while under 14"; Koi grow faster when not colored; if color too early, may spoil color when older
 - 3. Larger Koi, in my experience, grow faster on staple food without spirulina, so I only feed spirulina for 3 months each year before shows
- d) Feed pellets the size that your smallest fish can eat; I have found that fish grow better on medium pellets than on larger pellets { may be factor of digestion }
- e) Supplement pellets with watermelon, oranges, grapefruit, freeze dried krill; do not use live food
- f) Feed amount of food that Koi can consume in 5-8 minutes and never feed more than your filters can handle

70-75 degrees:

- a) Feed same as above, but feed only 4 times per day
- b) Start to feed bulk recipe 2 times per week to increase fat (recipe at end of handout)

60-70 degrees:

- a) Feed 3 times per day
- b) Stop krill

55-60 degrees:

- a) Feed 2 times per day
- b) Use 50% wheat germ pellet
- c) Start selective feeding

50-55 degrees:

- a) Feed once a day using all wheat germ pellets
- b) Feed Cheerios for snack to wean owner off of feedings



less than 50 degrees:

- a) No food if temperature constantly below 50 degrees;
- a) Food can block intestines and will not digest

Bulk Cube Recipe

10 oz frozen collard greens, 10 oz frozen peas and carrots, 5 oz imitation crab meat, 1/2 cup chopped green pepper, 3 tbsp wheat germ, 3 cups water for puree, 6 pkts Knox unflavored gelatin, 3 cups boiling water.

Combine first 6 ingredients in blender to puree {may need to do 1/2 at a time}. Place puree in large bowl. In separate bowl, dissolve gelatin in boiling water and stir. Combine gelatin with puree mixture and stir. Pour mixture into small ice cube trays, which have been sprayed with Pam. Recipe, makes about 12 trays. Place in freezer with waxed paper between trays if stacking them to prevent sticking. Feed frozen cubes as needed.

Should Your Koi Be Eating This Food? or Food for Thought!

By Robert Cirillo
Reprinted from [KOIUSA](http://KOIUSA.com)

I saw a gentleman throwing stones into a pond. When I questioned his actions, he said he was feeding his fish. He was serious. He was feeding pebble hard pellets to Koi and assumed that because it was sold as premium food he was doing the right thing. WRONG!

Let us start by asking ourselves where Koi in nature (since the only means of digestion is an intestinal tract and they do not have stomachs) consume this substance? I cannot think of any. Can you? Where in nature would a Koi swallow a gritty rough, extremely dry substance to sustain life? Just imagine what damage is taking place on both ends of this equation, not withstanding scarring the intestinal walls. All food should be moistened before feeding if they are hard and dehydrated. Improper digestion of foods can lead to disastrous results. Let us now ask ourselves exactly what goes into these foods. How are they manufactured? What are the ingredients? Does the label give a realistic picture of contents? Can I feel good about my Koi's diet?

Manufacturing

Ingredients are either heated, irradiated, cooked homogenized, hydrogenated, sterilized mummified, fortified, with color enhancers and preservatives added and then packaged. Many

manufacturers use several of the above processes along with the flattening or rounding or extruding of the ingredients to obtain a uniform shape. All of the above steps destroy most nutrients and add unwanted saturated fats or dangerous carcinogens. The hydrogenation process and preservatives alone bring many negative side effects. When you add vitamin destruction, there really is not much left. Tossing all of this into a clear container adds insult to injury since light destroys water-soluble vitamins. Look to see how many manufacturers package their foods incorrectly.

Ingredients

First consideration should be whether or not ingredients are pharmaceutical grade or animal grade. The former must pass standards for human consumption. The later has standards less strict and imposing. The former takes into consideration purity and negative substances. The later passes on many negative compounds. The manufacturer decides which road to take.

Proper protein (with all amino acids, which are their building blocks), proper lipids (which are fats that must be unsaturated), proper carbohydrates (derived from plant material) and proper fiber (which should be water soluble) must be fundamentally correct if any Koi are to exist or flourish.

A) Protein from insects, earthworms larvae, etc. is desire for Koi. Our fish do not consume crab by-products or meat by-products laced with preservatives in their natural habitat. We are dealing with a fish, without a stomach. From the beginning to the end, digestion of food is quick and should be easily absorbed and manufactured into new cells. If the feces sinks proper absorption is not occurring. If hydrogen is added to protein, a saturated negative altered by-product, which prevents cells from absorbing nutrients, occurs. PLEASE READ THE LABEL CAREFULLY BEFORE FEEDING.

B) Lipids, fats that are unsaturated are the only fats Koi should obtain. Fats not only supply needed energy, but also are the catalyst by which all nutrients are distributed to cells.

Hydrogenated fat becomes super saturated, causing cell damage, mutation and total blockage of nutrients. The only reason to add hydrogen to a fat is to extend shelf life. It does not benefit the Koi's life in any way. Fats from animal sources are harmful, unless they are omega 3 essential fatty acids.

None of the labels, to my knowledge mention omega 3. Fat, from plant material, as long as they are not saturated due to processing are fine. AGAIN, PLEASE READ THE LABEL.

C) Carbohydrates all convert into sugar. This is how all animals, including fish, derive their major source of energy for movement and mental functions. Excessive carbohydrates or improper carbohydrates become fat. Excessive fat, however, when going into a dormant winter cycle many be helpful.

During an active cycle, excessive carbohydrates leading to excessive fat are not warranted. Carbohydrates derived from basic plant forms are preferred. They break down quickly, aiding digestion and place less demand on the liver. Grain carbohydrates break down slower, have a tendency to convert to unnecessary fat, and place an unwanted load on the liver. Feeding Koi cereals was never a good idea. In a natural



environment a Koi would eat plant material e.g. algae, pond grass. Etc. There is not much grain here. Most, if not all, carbohydrates in manufactured foods are derived solely from wheat, which is inexpensive and readily available. Grain must be balanced with green vegetation to be acceptable. Does any food manufacturer balance its carbohydrate mix? PLEASE READ THE LABEL CAREFULLY.

D) Fiber should only be derived from undigested plant material occurring naturally in the digestive tract and never intentionally added to increase fiber content. Plant material contains a water-soluble fiber and is the only type acceptable for Koi. Gritty, fibrous materials are dangerous and not warranted. PLEASE READ THE LABEL.

An aspect that has not been mentioned is electrolytes. Electrolytes are simply minerals. Minerals are essential for all electrical nerve functions, formation of skeletal material and maintenance of a proper immune system. An imbalance of any mineral leads to negative results. Simply adding minerals to food is not enough. If one mineral is not balanced properly with all the others, a lack of absorption of one or several can occur, and this leads to poor health; even death. Minerals are as essential to life as water. Without food many creatures can exist, but dwindle away over a long period of time. Without water, death is guaranteed and without minerals, death is guaranteed.

Finally the Label

Unfortunately, the label and complete packaging of the manufactured product receives most of the manufacturer's budget. Yes, the outside costs more than the inside! More time is focused on the look, appeal, and image than anything else is. One manufacturer can come out with many different labels boosting different results but the contents are basically the same.

They will add selling point remarks on the label such as: fortified with stabilized vitamin C (even though stabilized vitamin C is not absorbed by fish); contains synthetic vitamin E, (except only 20%, if that much, of the synthetic vitamin C is utilized); contains color enhancers, which is fine as long as your fish have red or orange, if they contain any white pigmentation this becomes muted gray and less intense. PLEASE READ THE LABEL CAREFULLY.

What then would be the best approach when purchasing food for Koi? Mix and match. Do not become locked into one company, one food, or one set of ingredients. This assures, no matter what, a balance can be obtained. However, never, never, obtain a food that contains negative substances, e.g. hydrogenated ingredients saturated fats, synthetic substances, high fiber content, unnecessary coloring, and preservatives. Remember to moisten foods that are hard and dehydrated. Preventing a problem is easier than fixing one.

If proteins, fats, carbohydrates, and fiber are all correct, then adding vitamins and minerals at our own discretion at the time of feeding assures proper nutritional balance. We spend more time with the technological end of Koi keeping, such as complicated filters, vortexes, oxygenators and bottom drains, then we do with the most important aspect - feeding. Many of

us pick up a bowl of Koi food, empty it into a pond on our way to work and never consider what the ramifications are to this simple task. Not only should we maintain the best diet, but we should also watch while they are feeding to inspect closely for unnatural habits. You know your fish. Remember they do communicate! You simply have to know how to "read" them.

Please read labels carefully. Your Koi's future is in your hands. You are what you eat. It is that simple.

FACT: Whether human, bird, dog or fish, the more a food is touched by man, processed by man, and handled by man, the more dangerous, negative and non beneficial it becomes.

FACT: The lower we all eat of the food chain, the healthier we all become.

Nutrition

Proteins & Amino Acids

25% to 56% of a Koi's diet should be protein. Younger fish need more protein. Primarily, protein is a source of building material and secondly a source of energy. There are 10 essential amino acids: Arginine, Histidine, Isolucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan and Valine. Fats & Lipids 12 % of the Koi's diet should be fats and lipids. Fish easily digests unsaturated fats, but sucrose, lactose, and starch are poorly digested. Excessive carbohydrates can increase the blood sugar and liver mass to potentially pathogenic levels. Fats and lipids are a major source of energy and they are necessary to carry fat-soluble vitamins - A D E K. They are essential for the health, growth, and normal appearance of the fish.

Carbohydrates

Less than 20% of the diet should be carbohydrates. Fish metabolize carbohydrates at a lower level than higher animals. As the chief source of energy, carbohydrates are very important to the fish's diet. Many fats require carbohydrates for their breakdown. But sucrose, lactose, and starch are poorly digested. Excessive carbohydrates can increase the blood sugar and liver mass to potentially pathogenic levels. Excess carbohydrates are converted into fat.

Fiber

A dietary requirement for fiber in the diet of fishes has not been investigated extensively. Fiber has been demonstrated to be nonessential in the diet of channel catfish and trout. Other data indicate it should not exceed 4% for salmonoids. Fiber is the part of the food that is not digested, but it is necessary for the normal functioning of the intestine. Excessive amounts of fiber can reduce the nutrient intake and impair digestibility.

Vitamins

.....	mg/kg of diet	.....	remarks
Vitamin C.....	100.....	.....	not stored, used rapidly under stress
B12.....	02.....	.....	stored in liver, heart, blood & brain
Biotin.....	1.....	.....	stored in kidney, liver, & brain
Choline.....	3,000.....	.....	destroyed by high temp & sun light
Folic Acid.....	5.....	.....	destroyed by high temp & sun light



SAKA News



Inositol.....400.....destroyed by high temp & sin
light
Niacin (B3).....150.....stored in liver, destroyed by sun
Pantothenic.....40.....not stored, destroyed by high
temp
Riboflavine.....20.....not stored, destroyed by high
temp
Thiamin10 not stored, destroyed by high
temp
Vit A 2,500IU..... stored in liver, fat soluble
Vit E..... 30IU..... stored in liver, fat soluble
Vit K10IU..... stored in liver, fat soluble
Vit D.....2,400IUstored in liver, fat soluble

Minerals

..... mg/kg of diet remarks
Aluminum2..... must be supplied by diet
Calcium3,800naturally in water
Chloride1,060naturally in water
Cobalt16
Copper12.5..... must be supplied by diet
Iodine..... 5naturally in water
Magnesium1,095must be supplied by diet
Iron 220must be supplied by diet
Manganese 15
Phosphorous.....5,170..... naturally in water
Potassium5,300naturally in water
Sodium1,280naturally in water
Sulfur..... 1,500
Zinc14 must be supplied by diet

October 22, 2006

Constance Richardson

November 2006

27th SAKA Koi Show & Auction

December 2006

The Panter's



26th Annual AKCA Seminar

Phoenix Marriott Mesa

Mesa, Arizona

June 21-24, 2007

Hosted by SAKA & VSKC



Kawarigo Korum

UP COMING EVENTS

August 27, 2006

Bruce & Wanda Triebel

September 24, 2006

The Young's

October 6-8, 2006

1st Las Vegas Koi Show

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Tucson, AZ

792-2244 or

1 (800) 844-2244

Mountain View Koi Fish & Aquatic Plants

3828 Keeling Road,

Herford, AZ

378-3710

Rancho del Koi

3400 S. Sagauro Shadows Drive

Tucson, AZ

886-8797

July 2006



SAKA News



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 Month year



Annual Membership

Dues are \$25.00 per family from March 1 to February 28 or 29 of the next year. If paid after August 1 \$17.50, September 1 \$15.00, October \$12.50, November \$10.00, December \$7.50.

Membership Type

___ Renewal
 ___ New Member

Name: _____

Address: _____

City: _____

State: _____

Zip: _____

Phone #: _____

E-mail _____

Today's Date: _____

of Koi _____

Years Keeping Koi: _____

Pond size: _____

Would you like to host a meeting?

Would you like to serve on a committee?

___ If yes which one?

Make Checks payable to: SAKA

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 Tucson, AZ 85704-4110