



A bearded dragon eating a locust.
Photo courtesy Adrian T Jones/www.shutterstock.com

How to gut-load live food more effectively

Pete Hawkins has some tips to help you get the best results, ensuring that your animals obtain maximum benefit from this process, having carried out his own studies in this area.

The reason behind insect gut-loading is simple one. You are adding vital nutritional value to the bugs, by supplying food items for them to eat, prior to feeding the said bugs to your reptiles. This in turn then makes gut-loaded live food more valuable as a source of food for the animals, helping to guard against possible nutritional deficiencies, as distinct from providing bugs with empty stomachs.

The theory is of course easy. Just throw in a small amount of bug food alongside the insects, and let them eat. Unfortunately though, as is often the case in life, things are rarely that straightforward. You will need to consider which fresh foods are most valuable as well, in addition to deciding which commercially available gut-loading foods you want to use.

Gut-loading in this respect is an art as well as a science, ensuring as far as possible that your reptiles obtain maximum benefit from it. Another important consideration is the type of food that your reptile will normally eat. You need to be sure that you are providing plenty of variety in this regard, rather than just relying on supplementing the animal's live food.

Don't lose sight of the fact that the aim is to provide a balanced diet overall. Nevertheless, the vast majority of the bugs that are readily available to buy at your local reptile store or online will take and eat similar food items, although minor tweaks



may be required in some cases, as explained later.

Raiding the fridge

Plant-eating reptiles should be offered a wide range of foods, including greens, other vegetables and herbs. But you can also provide smaller amounts to the bugs as food, offering another gut-loading option, although the benefits in this case are likely not to be as great as if you use a concentrated gut-loading food. Should you

▲ You can feed plant matter directly to some lizards such as bearded dragons, as well as to live food.

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be feeding greens to your reptile though, offer herbs perhaps to your bugs, as these will contain a slightly different range of nutritional ingredients. They can even be mixed with a gut-loading food.

As an example, you might have squash, rocket (arugula), kale, spinach, carrot, collard greens and potatoes available. You could feed your bearded dragon both squash and kale for a couple of days, while offering potato and rocket to the bugs. This effectively doubles up the range of foods,



Collard Greens - Spring Greens (per 40g):

Vit A	36.00%
Vit C	21.00%
Fibre	5.00%
B-6	5.00%

Kale (per 70g):

Vit A	133.00%
Vit C	133.00%
B-6	10.00%
Potassium	10.00%

Butternut Squash (per 100g):

Vit A	212.00%
Vit C	35.00%
B-6	10.00%
Magnesium	8.00%

▲ You may be able to grow some of these foods such as butternut squash at home, especially if you have access to a garden. Growing conditions do actually impact on their nutritional values.

Photo courtesy Diana Taliun/www.shutterstock.com

and multiplies their individual nutritional benefits, given that the bugs are eating something different to the bearded dragon. A simple rotation method of this type is all that is needed to maximise the potential nutritional impact of the bugs for our reptiles.

One step further

Personally, I take things one step further. I aim to marry up the particular nutritional values of food items offered to the bugs, to balance these with greens that I am supplying to my bearded dragon as example. Obviously, this isn't possible in all cases, if you have insectivorous rather than omnivorous lizard. But here again, you can provide variety, by offering various types of bug that have been gut-loaded with different foods. After all, lizards will eat a wide variety of such creatures in the wild.

Let's take a look at some typical nutritional values of foods commonly offered to plant-eating reptiles. By rotating these over several days at a time, so the nutritional benefits can be increased - collared greens for example are a relatively poor source of Vitamin A, as an example, compared with butternut squash.



Potato (per 75g):

Vit B-6	10.00%
Vit C	24.00%
Fibre	6.00%
Magnesium	4.00%

▲ Collard greens are a form of cabbage, sold in many supermarkets and greengrocers.

Photo courtesy Brent Hofacker/www.shutterstock.com

▼ Kale of different types is now very fashionable again for its nutritional properties, with the rise of superfoods, even being made into juices, so it is widely available.

Photo courtesy John E. Manuel/www.shutterstock.com

The trouble is often that we simply do not appreciate the need for variety in our reptiles' diets. This, after all, is how they manage to obtain a balanced diet in the wild. Feeding bugs that have not eaten to your reptiles is rather like us eating a sandwich with no filling. There will be some nutritional benefit, but clearly, it is not as great as if we thought about other ingredients that could be used as the filler.

It's not all about the food...

If you are a follower of my Facebook group, you will know just how important I consider reptile hydration to be, in terms of their overall health, and maintaining a good appetite. Well, when it comes to our bugs, there is no change. They can serve as valuable hydration vessel - many desert-dwelling lizards in particular are well-equipped to conserve water, and will obtain it from their prey.

Taking one step backwards, fresh items offered to live food will help to keep them hydrated, but I always provide additional means. I'm a fan of the ProRep's hydration balls, or you can choose simple bug-water crystals. Using such items means there is no risk of the insects drowning, and they should be optimally hydrated as well.



▲ Crickets as supplied with eggs packs. They must be able to stay hydrated, so a special, safe drinking option must be provided. Photo courtesy Vladimir Wrangel/www.shutterstock.com

Silkworms are one of the newer live foods available today, which featured in Pete's tests. Photo courtesy wk1003mike/www.shutterstock.com

Extras I use for gut-loading

There is perhaps a surprising range of gut-loading options now available, all designed with the common aim of getting that extra nutrition into the said bug. Over the years I've tried so many. To be honest, some worked while others were useless in my opinion. Now, I have settled on just a few to aid the gut-loading process.

The best of the bunch by far, in my opinion, is Arcadia EarthPro InsectFuel which is one of the most recent additions to this product sector. InsectFuel is an alfalfa-based food and gut-loader. It includes carotenoid (for Vitamin A production), bee pollen, and other beneficial non-toxic ingredients derived from plants plus minerals like calcium. I've tested this product both damp and dry. It gets eaten readily by all my bugs, making it the most useful gut-loader on the market.

The other main product from this sector that I use regularly is Nekton Cricket-feed. As the name suggests, it is intended for crickets. I have tried it with many bugs however, and all but locusts eat it without issues. It includes dextrose, fine bakery products, pollen, soya protein isolate (GMO free), and soya. Other worthy mentions in this category that I like are Repashy Bug Burger, and Vetark Nutrogrub. There is no shortage of choices, and a tub or pack will last a long time, so they are not expensive products, but will offer great benefits to your animals.

▼ The digestive period was longest in the case of cockroaches, such as the dubia species (*Blattella germanica*) seen here. Photo courtesy Kuttelvaserova Stuchelova/www.shutterstock.com



▲ Bee pollen may be included in gut-loading foods. Photo courtesy InspiringMoments/www.shutterstock.com

Specific methods for specific bugs

What I mean here is should you gut-load all bugs in the same way? The old routine of gut-loading for 24 hours, prior to feeding the bugs to your reptile. This is the established basic method and it does work, provided that the bugs have a sufficient supply to last throughout this period.

I did my own research regarding many of the common bugs we feed. It was time consuming, but I got results, and they have proved to be quite interesting.

It involved me separating out a single bug. I fed it nothing for 48 hours, making sure that all waste was excreted. Then I

would offer food again, and would watch it eat, which some did for as long as 30 minutes. Once the bug left the food, I removed it.

I then noted the length of time between when the bugs stopped eating and when they then started to produce waste. This will provide an insight into how fast they process and digest their food, which obviously is vital in terms of gut-loading.

Test conditions

A single bug in each case was housed in a single tub, in a rub set at 28-30°C (82-86°F) via a large heat-mat under thermostatic control. The results are rounded up to give 'average' times. I repeated the test twice on each species, using a different bug on each occasion.

■ **Crickets** – these were by far the fastest in terms of their gut transit times, and I tested a range, in terms of brown (silent), black, banded, cave, and horse-head crickets. They had a digestive turnaround of just two hours overall. So if you want to have a fully gut-loaded crickets, it is probably best to feed them for an hour or so, prior to feeding them to your animals, to ensure optimal gut-loading occurs. Of course, just leaving them food for 24-48 hours will be beneficial also. The only problem that you have is that you cannot be sure as to which individual crickets have eaten, which are still eating and which have just finished digesting their food.

■ **Locusts** – The time here was between three and six hours, being longer than in crickets.

■ **Roaches** – Again, I used a range of species, in the guise of dubia, lobster, turk, discoid and Cuban cockroaches. The digestion time was longer overall, although it did vary somewhat between the species. There was a period of about 12 hours on average between food being eaten by the cockroaches, and waste being produced.





▲ Divide up live foods into smaller batches in order to maximise the benefits of gut-loading. Photo courtesy pitagchai/www.shutterstock.com

■ **Super-worms/morios** – As with locusts, the period in this case was around 3-6 hours.

■ **Silkworms** – this was a short period, more in line with crickets at about two hours.

Other findings

The digestive period was dramatically affected by keeping the bugs at room temperature. As they do require heat for optimal digestion, I felt that I'd test them under these warmer conditions, which are the same as those that I use for storing bugs.

When kept at room temperature, more deaths occur due to the bugs being

unable to digest the food properly because of a lack of warmth. This was particularly apparent with crickets and locusts. Roaches will manage to adapt better, although I find many species just will not eat unless kept at warmer temperatures. The same applies to super-worms/morios, which are far more aggressive about feeding when housed at a warmer temperature.

Recommendations

Here are some general recommendations therefore, based on what I discovered, irrespective of whatever type of live food you are using. If you have large batches, separate out the batch that you need, around 12 hours prior to feeding these

bugs to your reptiles.

Then gut-load them and hydrate to the maximum. This way, you are not doing a lucky-dip regarding whether you have a fully loaded bug, or an empty bug that may not have eaten recently in amongst a large batch. You can be certain that each member of the small batch of bugs will have had the opportunity to eat and hydrate properly.

Obviously, carry on gut-loading the entire batch every day as well. That is very important, although the chances of the bugs deriving maximum benefit from their food will be greatest if you follow this method of splitting them into smaller numbers at this stage.

Conclusion

When we purchase live food for our animals, we have no real idea as to what the insects have been fed on up to this stage. It is therefore important to aim to maximise their nutritional value from this stage onwards, keep them hydrated and, of course, clean. Don't forget that not only will these steps help to improved their nutritional value, but they will also keep them alive longer, thereby reducing your overall feeding costs as well. You need to care for your bugs just as you would for the reptile that is going to eat them.

Always bear in mind the old saying that 'you are what you eat' really is true. This is particularly significant with reptiles and amphibians, given that what they eat is what we as keepers provide them. They have absolutely no input in the choice of food provided. The only decision that they make is whether they will eat it or not. ❖

▼ Understanding the nutritional breakdowns of common live foods and how to increase their value is vital.
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