

# focus on

# Supplements for



The health of insectivorous reptiles such as chameleons is directly affected by the nutritional value of their prey.

# insectivores

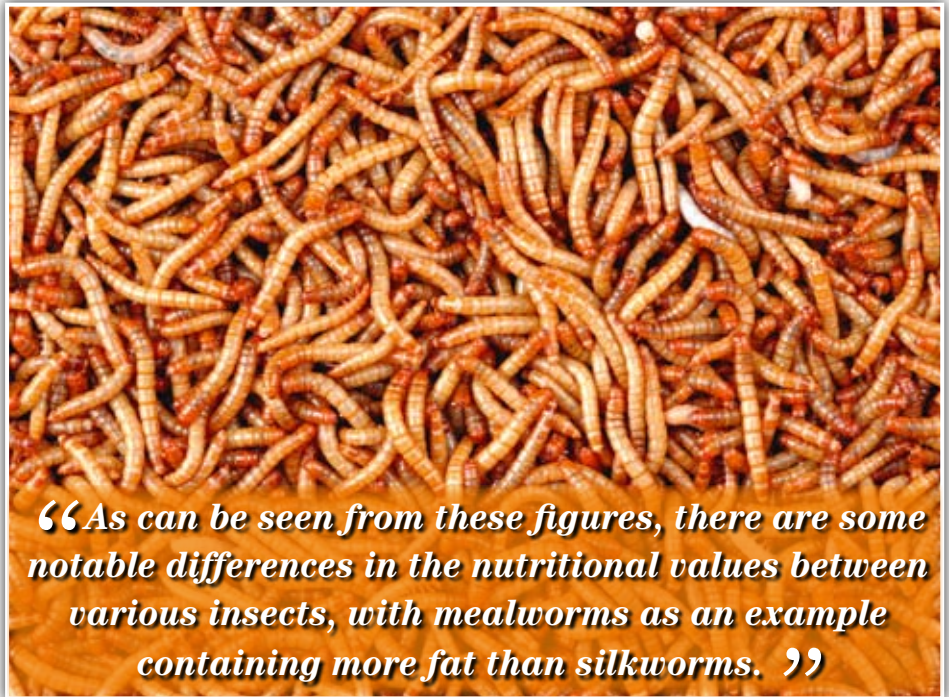
There is no doubt that the ever-increasing range of feeder insects available today has made it easier to cater for insectivorous species, but don't be misled. This is only part of the story, as Andy Tedder explains.

**T**o quote an old adage "you are what you eat", and the health of your reptile will be directly influenced by the food that it is offered. Although a varied diet of commercially-available insects is often recommended, this is no guarantee that you will not encounter problems in your collection.

Tables 1 and 2 show nutritional values typical of the most common feeder insects used in herpetoculture today. As can be seen from these figures, there are some notable differences in the nutritional values between various insects, with mealworms as an example containing more fat than silkworms. Offering a varied diet helps to compensate for individual shortcomings and excesses. But this alone will not be sufficient. Adult crickets, for example, have a relatively low calcium content, as set out in table 2, and to obtain adequate calcium, a reptile would need to eat a very large quantity of these insects. Unfortunately though, crickets also have a relatively high fat percentage, as shown in the first table.

The importance of calcium

Worse still is the cricket's calcium:phosphorus (Ca:P) ratio. This is a particularly significant part of



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Table 1 Proximate nutrient composition of commercial invertebrate prey.

Species	Latin Name	Water % (%DM)	Crude Fat (%DM)	Total Nitrogen (%DM)	Crude Protein (%DM)	ADF-N (%DM)	NDF (%DM)	Ash (%DM)	
Commercial Cricket:	<i>Acheta domesticus</i>	Adult	62-73	19-44	10	40-68	0.7	19	2.7-5.1
		Juvenile	67	10	9	40-50	0.6	16	9.1
Mealworm	<i>Tenebrio molitor</i>	56-66	31-60	8-9	35-55	14	4	3.0-7.0	
Superworm	<i>Zophobas morio</i>	57-59	41-44	6.9	40-50	0.4	13	2.9-3.5	
Waxworm	<i>Galleria mellonella</i>	62-63	51-73	5.5	21-41	0.4	12	2.7-3.3	
Silkworm	<i>Bombyx mori</i>	61-80	4-21	8.7-10	65	NA	NA	5.2	
Fruit Fly	<i>Drosophila melanogaster</i>	67	18	9.0	NA	NA	NA	5.2	

Acid-detergent fibre-nitrogen (ADF-N) is used as a measure of the nitrogen present in chitin (a non-protein nitrogen), and neutral detergent fibre (NDF) is used as a measure of complex carbohydrate. DM stands for dry mass. NA = not available.

Table 2 Mineral concentrations (on a dry matter basis) of commercial invertebrate prey.

Species	Latin Name	Ca %	Mg%	P%	Cu (mg/kg)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)
Commercial Cricket:	<i>Acheta domesticus</i>							
Adult		0.1-0.2	0.08	0.8-1.4	8.5	112	30	186
Juvenile		0.1-1.3	0.16	0.8	9.6	197	53	159
Mealworm	<i>Tenebrio molitor</i>	0.04-0.12	0.28	0.9-1.4	18	40	6.8	131
Superworm	<i>Zophobas morio</i>	0.03-0.12	0.18	0.6-0.8	14	50	1.5	88
Waxworm	<i>Galleria mellonella</i>	0.06-0.07	0.09	0.6-1.2	3.1	77	3.3	79
Silkworm	<i>Bombyx mori</i>	0.21	0.24	0.54	NA	NA	NA	NA
Fruit Fly	<i>Drosophila melanogaster</i>	0.14	0.13	1.1	8.7	454	16	147

the diet of reptiles, which is crucial in ensuring a healthy skeleton. The ideal Ca:P ratio is typically 2:1. But if the ratio in the food is slanted towards phosphorus, then in the absence of any other source of calcium, signs of nutritional illness such as metabolic bone disease (MBD) will soon become apparent. This can be manifested by lethargy and weakness, with skeletal abnormalities, fractures and muscular twitching being amongst the symptoms. Fast-growing young reptiles such as water dragons (*Physignathus* species) are particularly susceptible, because of their high



In the wild, reptiles generally have a varied diet of invertebrates, which helps to balance out nutritional deficiencies or excesses.

requirement for calcium as they grow, to ensure a healthy bone structure.

### Types of supplement

One of the way that such imbalances may be corrected is by means of 'gut-loading'. A question often posed at this juncture is: "Who gut-loads insects in the wild?" The answer of course is that insects will eat a varied diet in the wild, and reptiles themselves eat a much more varied range of prey species. The nutritional value within the bodies of wild insects is generally much higher than that of their commercially-available counterparts, which are typically raised on bran in a number of cases. This foodstuff actually contains phytic acid – a chemical that blocks the uptake of calcium through the intestinal wall.

So what constitutes a good diet for feeder insects then? Variety is the answer. Crickets for example will typically eat a huge range of vegetables and leaves. So it is a good idea to feed them with root vegetables, fruit, and dark leaves a day or two before you intend to offer them to your reptile. Not only does this vastly increase their nutritional value, but they will also live longer on this type of diet, so you can cut down on the number of boxes you need to buy!

Is this enough? Is properly gut-loading your insects sufficient to give your reptile all the nutrients it needs to live a healthy life? Unfortunately, the answer is no. Although it increases the range of nutrients, it is pretty unlikely that you will achieve a calcium-phosphorous ration of 2:1 by this means. As a result, it is also highly recommended that you supplement the insects with a separate source of calcium.

'Dusting' the feeder species with calcium-rich products immediately before the insects are offered is a particularly good way to alter the Ca:P ratio in favour of the calcium. This should allow for healthy bone growth and maintenance. Special dusting powders for particular species are now available, as well as general products of this type.

### Calcium and Vitamin D3

However, calcium metabolism also requires another component, in the form of Vitamin D3, which controls the absorption of this mineral from the intestinal tract. D3 is typically synthesised from UVB light, which is fine if your animal is diurnal and has a UVB light source. However, if you have a nocturnal animal, without a ready source of vitamin D3, then you should consider using a multivitamin powder as part of your supplement schedule, which contains this ingredient. There are a variety of species out there, and so it is not practical to give a general supplementation schedule to suit all insectivorous reptiles, but you can find this information on the internet, or contact the manufacturer for advice. Stick to the

recommended levels however, as overdosing can prove harmful, especially in the longer term.

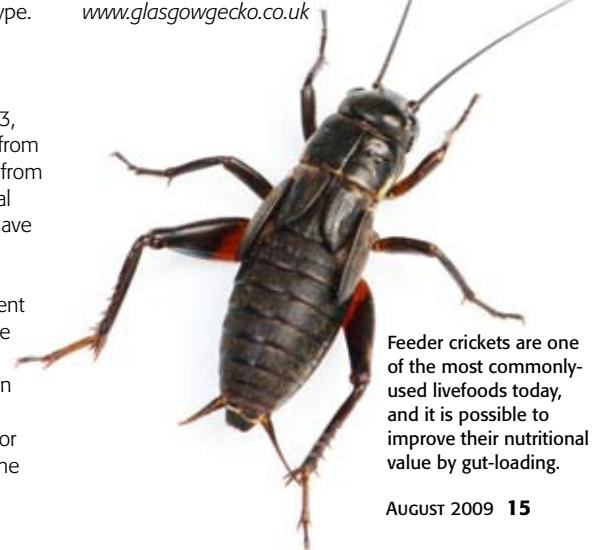
### Mealworms broken down

A further interesting point that is apparent from table 1 is contained within the column labelled ADF-N (%DM). The figures here indicate the chitin content in the hard outer casing of invertebrates. As they show, all invertebrates have some chitin, but this is present in mealworms in substantially higher quantities than in most other species. Is this a problem? The simple answer is no, as chitin can be broken down in one of two ways, either by beneficial microbes present in the intestinal tract, or by the presence of specific chitinolytic enzymes produced by the reptile itself.

So why are there frequent reports of undigested mealworms being passed in the faeces of many reptiles? This could be due to a number of factors, but the most likely explanation is that their husbandry needs are not being adequately met, particularly in terms of temperature. Reptiles are exothermic, and so require external heat for bodily functions. If they are being kept at a sub-optimal level however, with no basking spots in the vivarium, then proper digestion of prey becomes difficult, if not impossible.

Quite often, in my experience, people report that it is the empty chitinous shell of the mealworm that is being passed in the reptile's droppings. This is not necessarily a bad thing though, as it is the body parts within this casing where the nutrients are concentrated, suggesting that this part of mealworm has been digested during its passage through the reptile's intestinal tract. ■

\* Andy Tedder is an enthusiastic breeder of geckos with a specific focus on day geckos (*Phelsuma* species). Read more about reptile nutrition and husbandry matters at his website [www.glasgowgecko.co.uk](http://www.glasgowgecko.co.uk)



Feeder crickets are one of the most commonly-used livefoods today, and it is possible to improve their nutritional value by gut-loading.