

## Safe and unsafe plants

The very frequent question in Chameleoculture is:

“What plants should/should I use for my captive environment?”

As in any questions, it is much better to understand the context and function which the plants play in the ecosystems and what specific relationship and meaning they have for the arboreal (or arboricolous) chameleons, rather than to get a simple advice out of the skies.

The first and most important rule is:

...as chameleons live on living plants in the wild, they should be provided living plants in captivity too.

Absence of living plants in captivity can very negatively influence the wellness of the captive chameleons. Dying plants in cages are a good sign either of wrong choice of the plants, or wrong care for them, but definitely it is a serious indication of unsuitability of the environment for the chameleon: if it is not good for plants to live, it is not good enough for a chameleon either. Any attempt to trick the natural environment by using fake plants and plastic vines and branches has negative consequences on the health of the chameleons and can lead to their suffering and death. Not only do the plastic plants not possess most of the vital properties of the natural plants, but they add unnatural environment elements and poisons and micro-plastics to the environment too. Therefore, abscond from using fake plants by all means.

The best advice as always we get from the Mother Nature. It is advisable to get descriptions of the original biotopes from:

- **books and papers**  
There is lots of published material on many species and on many others, the information might be scarce or absent.
- **researchers**  
People with personal experience from the field, studying chameleons or other aspects of the natural biotopes have lots of useful observations.
- **locals**  
Local people might have very good info on where the chameleons live, especially the kids or the herdsmen and farmers - but very often you get the “wise” comment to hear “they are everywhere, they appear when you do not search for them and when you do, they disappear” and sometimes, you find out that the locals do not have any knowledge at all or they ignore them or do not talk about them because of religious reasons or superstitions.
- **travellers**  
People travelling to areas where chameleons occur as environmentalists, tourists, mountaineers, technicians, construction workers, medical doctors, teachers etc. can come across a chameleon and gather interesting info also including photos and videos.
- **photographs and videos in the internet**  
Be very careful to believing photos and videos in YouTube, Flickr and

Instagram: they sometimes represent an awesome source of info, but they often do not show where exactly the animals “live”, but rather where they “have been found” or even more often “where they have been put to nicely and comfortably photograph or film them” and this might be extremely misleading (have you ever e.g. seen a great picture of *Calumma parsonii* sitting 12m high in the canopy of the tree? Probably not. But you can see many on sticks, low branches or bushes, where they do not live).

It is not only useful to determine the species of the trees or bushes the chameleons have been found at, but also the character of the biotope, its density, thickness of the branches, the sun exposition, shade structure, surrounding vegetation etc... Chameleons usually prefer some plants to others, but basically they have no bond to specific plants and trees, they just need to be provided the necessary biotope structure and this is it, usually only escaping unpleasant plant characteristics like hair, too smooth, poisonous etc..

There is one big problem with the recent observations of chameleons in the biotopes: only a very limited number of species live in undisturbed biotopes in the wild. And in such, there are based on my experience extremely hard to find. It is also very hard to access these places, as they are as a rule hard accessible, they are often situated in a protected nature areas such as reserves or national parks. Such places have special restrictions and access regimes (e.g. nighttime excluded) or are inaccessible or limitedly accessible for the reason of protecting either the nature (from human destruction or disturbance) or the humans (e.g. from wild animals such as leopards, elephants, buffaloes, venomous snakes or from dangerous terrain such as slopes, instable ground, marshland or swamps) or both. Therefore, a vast majority of observations of chameleons in the wild are made not in their original biotopes but in areas, which they secondarily invaded or accepted the man-made heavy changes of the landscape such as deforestation, drying the land for agriculture and turning it to farms, plantations, gardens or even urban areas. Some species of chameleons seem to cope with these changes quite well and live, thrive and reproduce in such areas, some species or populations disappear and become extinct.

The observations of chameleons from secondary biotopes or even from newly invaded biotopes are of course also valid (they do live there), but there can be a heavy bias in what is really natural for them and what they can only tolerate in certain extent or what kills them slowly. They are adapted namely only to these circumstances and factors, which they have evolutionary long-term “experience” with - which they were exposed to. They cannot anticipate what they never ever met in the original biotopes, as evolution is not predictive but reactive. As one example: feral Yemen chameleons in Florida are known to eat the berries of the Brazilian Pepper Tree (*Schinus terebinthifolia*), which are poisonous. They do not eat them because they like them (this tree comes from South America and does not originally grow in Yemen) but because the fruits remind them on some native berries in form and color, and, this is why they eat them. As the Yemen chameleons are relatively resistant against plant poisons, they do not die immediately but it definitely shortens their life and is nothing to be repeated in captivity. Or, *Furcifer oustaleti* in Florida has been reported to feed on Eastern Lubbers (*Romalea microptera*) which are poisonous. As they do not know

anything like this from their home-country Madagascar (local lubbers look different way), they have no negative experience and eat them and get poisoned.

There are plants, the chameleons are as a rule not living at, if they have the choice, such as: *Lantana sp.*, Bamboo, Conifers, *Eucalyptus sp.*, *Euphorbiaceae...* But, in some cases, the biotope modifications are so dramatic, that they accept also something, which they would not accept under normal circumstances, because simply, they have no other choice or they move through... So you can find *Trioceros hoehnelii* in Kenya or *Kinyongia tavetana* in Arusha, Tanzania on *Lantana sp.*; *Trioceros affinis* in Ethiopia or *Calumma ambreense* in Montaigne de Ambre, Madagascar on bamboo; *Chamaeleo calypttratus* in Florida, *Furcifer petteri* in Joffreyville, Madagascar and *Calumma parsonii cristifer* in Andasibe, Madagascar on pines; *Kinyongia boehmei* in Taita Hills, Kenya or *Furcifer rhinoceratus* in Ankarafantsika, Madagascar on *Eucalyptus sp.* and *Kinyongia multituberculata* in Tanzania or *Chamaeleo gracilis* in Kenya on spurges. This does not mean by any means that this should be simulated in captivity.

The general recommendation is:  
the captive environment should imitate and simulate the aspects of the natural environment meaningfully as close as possible.

First of all, we must know what biotope is the species in question living in, so that we can meaningfully design the cage. It is a big difference to design a cage for the Kenyan Leaf Chameleon (*Rieppeleon kerstenii*), living in grass or for the Yemen Chameleon (*Chamaeleo calypttratus*), living in the canopies of bushes and *Acacia* and *Zyzipha* bushes... The most important rule is: do not try to outsmart the Mother Nature, try humbly copy what works for millions of years. Believe me, you cannot do better... Of course, we have many limitations in availability of the right plants and in space that we are realistically capable to give to our chameleons, but the compromises must be meaningful and still keeping the character of the biotope in most and main aspects. As an example, it is of course not necessary to imitate thorns of *Acacia* in the captivity (e.g. for *Chamaeleo arabicus*, *calypttratus*, *dilepis*, *gracilis*), as they are potentially dangerous, but you should imitate the bark overgrown with moss and lichens for *Trioceros laterispinis*.

There are many functions that living plants fulfill in the natural environment for the benefit of chameleons:

#### **CLIMBING SURFACE PROVIDER**

**Benefits:** The branches and twigs of plants are the surface, on which the special chameleodactylous feet are safely gathering grip and provide safe touch-base for feeling safety and stable position in the environment.

**Risks:** Unsuitable climbing surfaces include:  
too smooth ones (like on palms or bamboo),  
too loose ones with bark and debris falling off (e.g. rotten decaying branches),  
those containing poisons (like the Ivy - *Hedera sp.*, causing skin burns

and badly healing lesions),  
those containing sap that contaminates the soles that are then problematically shed or can even glue the animals to the branch (like conifers),  
those containing polymerizing sap on latex-basis (some fig-trees - *Ficus sp.*, spurge - *Euphorbiaceae*)  
those containing sharp Microscopic fibers (like Bamboo) causing micro-injuries which get inflamed and attacked by fungal or bacterial infections.

#### **SUPPORT BASE PROVIDER**

**Benefits:** The plants build solid and reliable support, safe to wear the weight of the body and withstand movements, wind etc.

**Risks:** Too thin, too fragile or unstable bases or swinging lianas are not preferred because being unsafe and because chameleon feet are not adapted to move on them.

#### **SHELTER PROVIDER**

**Benefits:** The plants provide shelter against weather, especially wind and rain. Chameleons in general do not like heavily windy places and avoid vigorously the direct rain touch of their bodies.

**Risks:** Too open places expose them to rain and wind.

#### **SHADE PROVIDER**

**Benefits:** Leaves and branches provide shelter against sun rays, in all the parts of the spectrum and protect them against overdoses of individual rays and enable thermoregulation

**Risks:** Absence or insufficiency of shade exposes the chameleon bodies to: excessive UV, that damages cells and is carcinogenous, too bright light that can blind them, too high temperatures that influences destructively the function of many organs, especially the reproductive ones and speeds up the aging process.

#### **GASES MODERATOR**

**Benefits:** Plants provide very important gases:

at daytime they expel O<sub>2</sub>, a vital substance enabling breathing and essential for many physiological processes in organisms and at night they expel CO<sub>2</sub>, a gas that slows down physiological processes and helps to relax and sleep having slight anesthetic properties.

**Risks:** Not enough O<sub>2</sub> lowers the activity, not enough CO<sub>2</sub> lowers the quality of sleep and relaxation.

#### **HUMIDITY MODERATOR**

**Benefits:** Plants moderate the air humidity in the surrounding air in increasing it in general and enabling fog to form and persist and thus being available for fog hydration.

**Risks:** Absence of plants causes lower air humidity in general and risk of desiccation or insufficient hydration.

#### **WATER BASE PROVIDER**

**Benefits:** Plants provide a big volume and surface of water to collect on leaves and branches and makes the liquid water available for drinking in the form of dew or water drops after mist or rain or after artificial misting. The prey gets moisture from eating the plants and drinking the water on leaves and stems too. Some chameleon species (e.g. Yemen and Arabian Chameleons - *Chamaeleo calyptratus*, *arabicus*) were speculated to gain moisture from eating leaves and berries, but it has not been proven so far whether they do it for this purpose.

**Risks:** Absence of living plants does not provide enough natural sources of liquid water to drink and leads to desiccation.

#### **HUNTING SPACE PROVIDER**

**Benefits:** Plants provide various natural places for the prey to land, stay and hide and make itself available for chameleons to hunt, move towards the prey and naturally feed. Smell of fresh or decaying fruits, nectar and pollen and some saps attract mainly flying insect and pollinators to come and expose them to the chance of being eaten by chameleons.

**Risks:** No natural environment reduces the options to hunt, causes necessity to shoot for too far or at too big prey items and can cause injuries.

#### **LIGHTING MODERATOR**

**Benefits:** Plants grow and thrive only if there is enough light for their photosynthesis. So, automatically, when chameleons live on living plants, they adopt an environment, where enough light is present richly in all the natural parts of its spectrum, that are vital for plants and chameleons: IR (infra-red, heat for thermoregulation, heat gain from the rays), visible light (for photosynthesis in plants and vision in chameleons) and UV (as antibacterial and physiological processes moderator for both plants and chameleons), all that in various intensity due to shade provided by the leaves and branches, enabling chameleons to choose the proper place and regulate their exposure to it.

**Risks:** Not enough light is fatal both for the plants (not sufficient photosynthesis, therefore collapse of the physiology) as well as for the chameleons (no heat – no thermoregulation; no light – no hunting, no communication, no reproduction; no UV – illness, physiological disorders).

#### **AIR FLOW MODERATOR**

**Benefits:** Plants slow down but foster at same time air flow through the canopies and provide protection to chameleons in sense of not being blown away by wind or blizzard and do not suffer from too intense air flow and heavy wind.

**Risks:** No protection can cause air streaming unfavorable for chameleons or too quick and intense wind that can harm or kill them.

#### **ETHERS PROVIDER**

**Benefits:** Plants produce lots of ethers that interact with the organism that come in contact with them. Though an integral part of the environment, they are extremely poorly studied, but what we know for sure is: they are a natural part of the environment and some play important role in the prevention of bacterial and fungal diseases.

**Risks:** Absence of natural ethers may lead to increased risk of diseases, especially respiratory ones and especially those caused by bacteria and fungi.

#### **ANTISEPTIC SPACE PROVIDER**

**Benefits:** Living plants - thanks to their complex anatomy and interaction with environment and antimicrobial and antifungal properties of their living parts - provide a space with limited ability of bacteria and fungi to survive, grow and reproduce.

**Risks:** No protection can cause bacteria and fungi growth and increase their concentration and subsequent infection of chameleons with sometimes lethal consequences.

#### **MIMESIS BASE PROVIDER**

**Benefits:** Dwelling in the canopies and in the protection of plants for millions of years led to co-evolution of:

structures of the bodies of chameleons imitating their surroundings (horns, scales, appendages, protuberances resembling twigs, lichens, leaves, grass)

patterns on the bodies (stripes and patches being in accordance with grass, leaves, twigs, game of light and shade)

typical movements of the environment (the leaf-walk, "pancaking" resembling a leaf in the wind)

to make the chameleon invisible.

**Risks:** In an environment without plants, the chameleon becomes quite conspicuous and can draw attention, in too spiky environment, there is a certain risk of injuries by the sharp thorns if plants, especially if the trees are not indigenous to the very area the pertinent chameleon species inhabits (Like e.g. *Zyzipha sp.* in NW Madagascar, introduced recently, causing many bad injuries to the Panther Chameleons - *Furcifer pardalis* e.g. at Ambilobe)

#### **PREDATOR PROTECTION**

**Benefits:** Plants provide a hiding space and make it very hard to impossible for the predators to find chameleons. Defecating from high in the plants down to earth does not leave scent traces for the predators to find them. Living in a thorny, hard accessible, densely vegetated environments makes it hard for predators to hunt for them and living high in the trees enables chameleons to let them fall down and increase suddenly the distance to the predator significantly and escape.

**Risks:** Being exposed to environment without plants is stressful as no hiding is possible, chameleons feel insecure.

#### **NUTRITION SOURCE**

**Benefits:** Plants provide the nutrition to the feeders and provide them with gut-load (plant materials, juices, nectars, pollen) and polluting their bodies with dust and pollen that is then eaten and digested by chameleons.

**Risks:** Chameleons can get poisoned by animals that feed on poisonous plants, such as e.g. the Monarch butterfly - *Danaus plexippus* (its caterpillars feed on poisonous milkweed) or they can get constipated by feeding on some fibrous plant material like moss, lichen, Spanish moss - *Tillandsia usneoides* etc.). If eating too much sweet and sour plant material such as fruits, nectar etc., they can get acidosis and destroy their homeostasis. If eating plant material of poisonous plants directly, they can get poisoned either acutely (immediately, with quick appearance of effects like vomiting, losing consciousness, death) or (much more often) the effects are repeated, chronic and cumulative: nothing visible happens short term, but the negative effect gets accumulated in their organs (esp. liver) and once getting over the margin tolerated, the animals shows the symptoms and dies. Luckily, chameleons seem to be rather resistant to plant poisons (such as *Pothos benjamina* sap, poisons of *Sansevieria sp.* and *Eupremnum* etc.), the area is however not investigated properly yet.

#### DUST COLLECTOR

**Benefits:** Leaves work like collectors of the everpresent dust, which is an important source of minerals, mainly Calcium, as CaCO<sub>3</sub> (limestone) comprises an important part of the dust volume. Licking leaves or feeding on dust-contaminated insects supplies important minerals.

**Risks:** Absence of plants can cause insufficiency in mineral supplementation.

#### DIGESTION AID SOURCE

**Benefits:** Some chameleons (e.g. Yemen and Arabian Chameleons - *Chamaeleo calyptratus, arabicus*) eat leaves to get indigestible fiber in order to better form the faeces and pass them through intestines.

**Risks:** Absence of plants can cause problems with digestion, vomiting or sepsis, intentional or incidental swallowing parts of fake plants leads to constipation and death.

As “**recommended**” plants, there are therefore those plants suitable, which fulfill the functions in the roles that they play in the wild and as “**not recommended**” ones are to be considered those that are avoided by the chameleons in the wild and can play negative role, harm or even kill chameleons if they get in contact with them.

#### Recommended plants:

Scientific name	English name	German name
<i>Epipremnum aureum</i>	Golden Pothos, Devil's Ivy, Money Plant	Efeutute
<i>Ficus benjamina</i>	Weeping fig	Birkenfeige

<i>Ficus alii</i>	Long-Leaf Fig, Amstel King	Oleanderfeige
<i>Schefflera arboricola</i>	Umbrella Tree	Strahlenaralie
<i>Asparagus densiflorus „sprengeri“</i>	Asparagus Fern, Emerald Fern	Zierspargel
<i>Chrysalidocarpus lutescens</i>	Golden Cane Palm, Areca Palm	Goldfruchtpalme
<i>Passiflora cearulea</i>	Bluecrown Passionflower	Passionsblume
<i>vAsparagus falcatus</i>	Sickle Thorn	grober Zierspargel
<i>Philodendron scandens</i>	Heartleaf Philodendron, Sweetheart Plant	Kletter - Baumfreund
<i>Thunbergia alata</i>	Black-Eyed Susan Vine	Schwarzäugige Susanne
<i>Dracaena surculosa</i>	Gold Dust Plant, Japanese Bamboo	Drachenbaum
<i>Monstera adansonii</i>	Adanson's Monstera, Swiss-Cheese Vine	kleinblättriges Fensterblatt
<i>Calathea makoyana</i>	Peacock Plant, Cathedral Windows	Korbmarante
<i>Spathyphyllum floribundum</i>	Snowflower, Peace Lilly	Einblatt
<i>Philodendron cordatum</i>	Heart Leaf Philodendron	Herzblättriger Baumfreund
<i>Nephrolepis exaltata</i>	Sword Fern, Boston Fern	Schwertfarn
<i>Begonia maculata</i>	Polka Dot Begonia	Forellenbegonie

### **Not Recommended plants:**

#### **Plants with too big leaves**

e.g. Swiss-Cheese Plant - *Monstera deliciosa*, banana species - *Musa sp.*, etc.  
Reason: too big leaves do not fit too small enclosures, provide too much shade

#### **Spiky, spiny plants**

e.g. Cactus - *Cactaceae*; Spurge - *Euphorbiaceae*; *Acacia*, *Mimosa* - *Acaciaceae*)  
Reason: danger of injuries, poisoning especially in limited space of the cage

#### **Plants with hair**

e.g. some Ferns; Nettle – *Urtica*; Dead-Nettle – *Lamium*  
Reason: danger of poisoning

#### **Swamp plants**

e.g. Marsh Calla - *Calla sp.*; Papyrus Plant – *Papyrus sp.*  
Reason: too soft and fragile, too much water needed, increasing the air humidity too much

#### **Bamboo species**

e.g. diverse bamboo species - *Bambusoideae*

Reason: too smooth - slippery, some too big – not possible to grasp around, some with sharp microfibers – risk of plantar micro-injuries, inflammations, lesions

### **Poisonous plants**

e.g. Poison Ivy – *Toxicodendron sp.*; Dumb Cane – *Dieffenbachia sp.*; Ivy – *Hedera sp.*; Red Ivy – *Hemigraohis sp.*; Milkweed - *Calotropis sp.* etc.

Reason: danger of poisoning through ingestion or contact, touch; can be eaten by feeders and poison secondarily

### **Fragile plants**

e.g. Spiderwort - *Tradescantia sp.*; Spanish moos - *Tillandsia usneoides* etc.

Reason: too fragile to carry chameleons (can carry babies however)

### **Plants producing excessive sap or wax**

e.g. Conifers - *Coniferae*; some Spurges - *Euphorbiaceae*; some Figs - *Ficus sp.*, etc.

Reason: soles contamination and infections, lesions, shedding issues; poisoning through ingestion or contact, touch (*Ficus benjamina* seems safe)

### **Plants with tough fibers**

e.g. mooses; Agave - *Agave sp.*; Spanish moos - *Tillandsia usneoides* etc.

Reason: danger of constipation after intentional or accidental (with a feeder) digestion