

## The Genus *Amorphophallus* (Titan Arums)

### Origin, Habit and General Information



The genus *Amorphophallus* is well known for the famous ***Amorphophallus titanum***, commonly known as "Titan Arum". The Titan Arum holds the plant world record for an unbranched single inflorescence. The inflorescence eventually may reach up to three meters and more in height.

Besides this outstanding species more than 200 *Amorphophallus* species have been described - and each year some more new findings are published. A more or less complete list of all validly described *Amorphophallus* species and many photos are available from the website of the **International Aroid Society** (<http://www.aroid.org>). If you are interested in this fascinating genus, think about becoming a member of the International Aroid Society! The International Aroid Society is the worldwide leading society in aroids and offers a membership at a very low price and with many benefits!



A different website for those interested in *Amorphophallus* hybrids is: [www.amorphophallus-network.org](http://www.amorphophallus-network.org) This page features some awe-inspiring new hybrids, e.g. ***Amorphophallus* 'John Tan'** - an unique and first time ever cross between ***Amorphophallus variabilis*** X ***Amorphophallus titanum***!



The majority of *Amorphophallus* species is native to subtropical and tropical lowlands of forest margins and open, disturbed spots in woods throughout Asia. Few species are found in Africa (e.g. ***Amorphophallus abyssinicus***, from West to East Africa), Australia (represented by a single species only, namely ***Amorphophallus galbra***, occurring in Queensland, North Australia and Papua New Guinea), and Polynesia respectively. Few species, such as ***Amorphophallus paeoniifolius*** (Madagascar to Polynesia), serve

as a food source throughout the Asian region.

As in other related genera within the broad Aroid family (Araceae), such as *Arisaema*, *Dracontium*, and *Typhonium*, most species develop a large, subterranean round to vertical elongated tuber or fleshy rhizome, which serves as a storage organ and may gain up to

60kg and more in the tallest species, such as **Amorphophallus hewitii** (Sarawak, East Malaysia), **Amorphophallus titanum** (Sumatra, Indonesia), and **Amorphophallus gigas** (Sumatra, Indonesia). In most species a single, long-stemmed, umbrella-like, dissected leaf is developed during each growing cycle. This single leaf resembles almost a small tree in the above mentioned giant members within the genus. In certain species, such as **Amorphophallus bulbifer** (widespread throughout India), a secondary leaf may develop under favorable growing conditions. Seedlings and young plants received via in-vitro propagation or by means of leaf cuttings tend to make several subsequent leaves before they will enter their true first dormancy period.



On maturity, plants usually produce a single inflorescence before the leaf unfolds. Few species may develop several inflorescences per tuber (e.g. **Amorphophallus polyanthus**) and/or make their inflorescence after leaf development. Some *Amorphophallus* species will rest for an entire year after flowering, i.e. they will skip one growing cycle. The inflorescence is composed of a sometimes very colorful outer spathe (a pseudo petal) and an inner spadix. The spadix may be shorter or protruding the spathe, and usually has a different color. The spadix hosts quite small male and female flowers at its base. The upper part (e.g. the spadix appendix) is usually the only visible part of the spadix. On the day of opening the female flowers are receptive and the spadix releases a sometimes very unpleasant strong scent, which is very attractive for its main pollinators, such as flies, and certain beetles. On the second day (or later) the female flowers are not receptive anymore, whereas the male flowers release their pollen. Thus one would usually need two inflorescence at more or less the same time in order to successfully transmit pollen from a first inflorescence to a second flowering plant. Few species are apomictic and may set viable seeds without pollination (e.g. **Amorphophallus bulbifer**, **Amorphophallus henryi**, **Amorphophallus kiusianus**, and **Amorphophallus muelleri**). After successful pollination the female flowers develop into some colorful berries, which may contain one to rarely two or three seeds each. In most species berries are bright orange to scarlet, whereas some may be bluish-lilac (e.g. **Amorphophallus kiusianus** from South Japan, East China, and Taiwan) or rarely whitish-green to yellowish-green. The ovate to elliptic berries are somewhat fleshy and are mostly dispersed by birds.

## Cultivation

In cultivation, most species are easily grown in any humus-rich, organic, very well drained and well aerated soil. The majority of *Amorphophallus* species can be grown at some 20 °C (optimal 25 °C) during summer in a semi-moist soil in a partially shaded spot with protection from direct sunlight, especially during hours at midday. Few tropical species, such as the famous **Amorphophallus titanum** from Sumatra, require an overall higher average temperature of some 25 °C throughout their entire growing cycle and during dormancy as well. Few species (mostly the beforehand mentioned tropical species) have a

prolonged growing cycle which exceeds 12 months, or they may be even evergreen (e.g. **Amorphophallus coetaneus**). However most species will follow seasons and their



single leaf will yellow from late summer to early winter. At this point, plants should be kept drier at a minimum of some 15°C. Tropical species require a higher temperature and very careful watering during dormancy. It is not essential, that dormant tubers are kept completely dry, but soil should not be soaked wet at any time

during dormancy. As a matter of fact, a dry storage will inevitably lead to losses in most tropical species. However, most African species from seasonally dry areas (e.g. **Amorphophallus andranogydroensis**, **Amorphophallus consimilis**, and **Amorphophallus dracontioides**) are best kept completely dry during dormancy.

Formerly, Amorphophallus species had been separated into two distinct cultivation groups with different cultivation requirements concerning soil composition, minimum temperatures and water supply during dormancy. On grounds of some more recent and more detailed cultivation experiences, most species can be successfully grown in one and the same soil mixture (see above). Different temperatures are not necessary during dormancy either. However, several highland species will come into growth earlier, probably in mid winter already, and hence they will require artificial light. It is not necessary either to keep soil completely dry during dormancy. Several species will show less vigor and minor growth, if the tuber is kept completely dry during dormancy. In most species, a slightly moist soil will be suitable (with exception for a couple of more delicate African species). As a general rule: the moister the soil, the higher temperatures have to be during dormancy. Tropical species require a temperature optimum of not below 25°C throughout the year, whereas some 15°C to 20°C are sufficient for all other species.

Most tubers stay dormant for some 3 to 7 months. Increasing temperatures during daytime stimulate new growth in most Amorphophallus species from spring to mid summer. Tropical species are less predictable concerning their growth cycle and may well come into growth at any time of the year. Thus artificial light during winter months and heat are essential factors to successfully cultivate these species. As soon as the new leaf appears from the center of the tuber, plants shall be watered carefully on a more regular basis and fed weekly till mid summer with any common fertilizer. Roots are developed primarily from the upper part of the tuber in most species, thus the tuber shall be planted deep enough, so that the roots may develop freely. Three times the size of the tuber is a suitable depth for most species. The tuber in immature specimens may increase its weight threefold or even more in a single season, hence the growing pot has to be of an adequate size to fit the newly developing tuber.

## Propagation by Seeds

Most Amorphophallus are extremely easily raised from preferably fresh seeds. If seeds cannot be sowed immediately, they may be stored for some weeks or months. Seeds from

**Amorphophallus kiusianus** and **Amorphophallus konjac** showed still good germination rates after more than 12 months storage at 7°C in semi-moist peat moss. However it is essential that seeds are constantly kept slightly moist (e.g. in slightly moist peat moss) and at lower temperatures of some 10°C in order to delay the germination process. Once completely desiccated or frozen, *Amorphophallus* seeds will have lost their viability and they will not germinate anymore. Prior to sowing the outer flesh has to be removed by thoroughly rinsing it away with water. Wear some protective hand gloves, for the flesh contains some very irritant substances. The flesh also contains some chemical which act as germination inhibitors. These substances will significantly delay germination, if the entire berry is sowed. Seeds are potted some 1 cm deep in the same soil mix as one would use for ault tubers. Soil should be kept slightly moist at all times. The optimal



temperature is some 25°C at day and some 20°C at night. One should add a couple of degrees for all tropical species. Most seedlings will occur within some 2 to 6 weeks (examples from the left: 6 weeks old **Amorphophallus gombocianus** seedlings and 6 months old

**Amorphophallus laoticus** seedlings). Some may take a couple of weeks more. Seeds of **Amorphophallus kiusianus** may well need some 6 months and more to germinate. Most seedlings show a prolonged growing cycle in comparison to older and mature specimens within the same species. Thus pots should kept warm in partial shade throughout the year as long as seedlings are “in green”, i.e. as long as they have a leaf. Several seedlings may make not only one, but two or more subsequent leaves before they enter dormancy for the first time. As a general rule, young dormant seedling tubers, as well as any other small offset tubers or leaf bulbils, shall not be kept completely dry during dormancy, as they may desiccate more easily.

## Propagation by Offsets & Leaf Bulbils

Apart from seeds, most species vegetatively propagate as well. They either propagate by stoloniferous offsets (e.g. **Amorphophallus albus**, **Amorphophallus antsingyensis**, **Amorphophallus bangkokensis**, **Amorphophallus impressus**, **Amorphophallus krausei**, and **Amorphophallus konjac**), by small adjacent tubers (e.g. **Amorphophallus thaiensis**, **Amorphophallus odoratus**, **Amorphophallus paeoniifolius**, and **Amorphophallus yunnanensis**) or rarely by leaf bulbils (e.g. **Amorphophallus beccarii**, **Amorphophallus bufo**, **Amorphophallus bulbifer** [see foto with large central leaf bulbil and three developping adjacent bulbils], **Amorphophallus muelleri**, **Amorphophallus yuloensis**, and **Amorphophallus xiei**). These offsets and small tubers shall stay attached to the main tuber until they can be separated easily. Leaf bulbils can be easily separated from the leaf after the leaf will have withered.



## Propagation by Leaf Cuttings

Leaf cuttings and in-vitro cultivation are some more dedicated advanced methods of vegetative propagation. Whereas in-vitro propagation requires some rather expensive material and special techniques and experience, it is quite easy and rather inexpensive to take leaf cuttings, even for not that experienced private cultivators. It has to be noted, that not all species can be successfully propagated from leaf cuttings. For example, so far this method has failed in **Amorphophallus konjac** and in **Amorphophallus paeoniifolius**. And in those species, which can be grown from leaf cuttings, not all cuttings will eventually make a tuber. But for the rarer species it is quite worth the effort, especially for those, which do not make any offsets or leaf bulbils (e.g. **Amorphophallus borneensis**, **Amorphophallus decus-silvae**, **Amorphophallus gigas**, and **Amorphophallus titanum**). From the latter four species, **Amorphophallus titanum** is easily propagated via leaf cuttings, provided that leaflets are mature and of an adequate size.



**The following material will be necessary to take leaf cuttings:**

- a transparent plastic box with cover, large enough to host the cuttings
- small pots with a bottom hole, preferably transparent to easily control root growth
- a sharp and clean knife and some alcohol solution for disinfection
- some labels and a pencil
- preferably some rooting hormone, especially formulated for leaf cuttings
- finely granulated, clean washed pumice or any other inorganic small grained substrate



A healthy leaf shall be chosen for taking cuttings. The cutting should be preferably made in the early morning hours, as long as the leaf is turgescient. The cut should be directly made above a branching point (see dotted red line).

Under optimal conditions, the leaf is some 1 to 3 months old. Younger leaves may be too immature, whereas older leaves may be programmed to enter dormancy already.

As an exception to the above rules, leaf cuttings can be taken at any time in a rescue try for a rare species with signs of a rotting tuber. It may prove easier to rescue a species by taking leaf cuttings instead of trying to rescue the infested tuber.



A typical cutting is some 10cm to 20cm (or more) long, depending on species and its size of leaflets. The cutting consists of at least one to three leaflets, maybe even some more in very small species to have a sufficiently large surface for photosynthesis.



The cut should be made straight with a very sharp knife and without squeezing the tissue.

As a general rule, from well grown plants 1/3 of a leaf can be taken. This way, the mother plant has a still sufficiently large leaf surface for photosynthesis and to increase its own tuber in size or to maintain its size. In very large mature specimens up to 1/2 of the leaf may be taken for leaf cuttings.

In the left example of **Amorphophallus macrorhizus**, some 1/4 was taken from the total leaf surface.



In between cuttings, the knife blade should be disinfected, e.g. by dipping it into alcohol. Let the knife blade dry up before taking the next cutting.

Preferably use a rooting hormone as directed on the package. Some species may be successfully propagated without using any rooting hormone. However, in general the success rate will be much lower and it may take longer for the cutting to make a new basal tuber.

Do not forget to write a label for each pot in order to not get lost with identifications, especially if cuttings from more than one species are going to be taken!



After taking the cutting, immediately dip it into the powder, shake off any excessive powder and plant the leaf cut vertically into a small pot. Depending on pot size, one or more cuttings will fit into a single pot (in the left example, two cuttings were planted). Pumice or any other inorganic substrate will work best. Organic substrates (such as peat based soils and the like) are less recommended, for these will usually promote bacterial and fungal growth.



Carefully place the small pot in a transparent plastic box and put on the cover to raise air humidity. The box should be large and tall enough, so that the leaflet tip will not touch the cover (possible rotting). Store the plastic box in a shaded place with some indirect sunlight at some 25°C to 30°C. Control humidity every other day and if necessary, mist the cuttings.

Cuttings will start to produce some callus tissue after some 4 to 12 weeks and a couple of weeks later some roots will form. A first small new leaf will eventually appear from the base of the cutting and/or the cutting will make a small dormant tuber before it will wither. If the leaf cutting withers and no new leaf has been created, carefully check its base. In most cases it will have made a small dormant tuber. Cultivation for these newly formed tubers is the same as mentioned above for growing seedlings.

## Pests and Diseases

In general, Amorphophallus species are rather trouble-free and easy-going in cultivation, provided that some basic cultivation guidelines are complied.

However, dormant tubers are sometimes prone to fungal or bacterial infections and rotting, especially in very moist soils and at rather low temperatures at the same time. If an infection is detected (parts of the tuber start to get slimy or mashy), an effort of rescue may be started by generously cutting away all infected parts. The rest of the tuber shall hence be dusted with some power fungicide and kept absolutely dry for several days before being repotted in a rather dry soil. In general and as a prevention measure against fungal infections, older plants should be kept rather dry during dormancy - with the exception of several tropical species, which have to be kept slightly moist throughout the year to prevent the tuber from dessication. If dormant tubers are stored unpotted and completely dry, they are more easily infested by mealy bugs. Thus a slightly moistened soil should be maintained in all species except for African members, which prefer a dry soil during dormancy. Leaves may be infested rarely with aphids and more often with spider mites. This especially occurs in winter months and if plants are kept at rather low air humidity inside the house. Any available insecticide spray respectively systemic solution formulated against aphids, spider mites and/or mealy bugs will work fine. Always refer to the directions of use as stated on the package. And before treating an entire collection with some new insecticide, a first trial should be made on a single plant in order to check for any unwanted side-effects.

Another, and much more serious pest are nematodes. These are very small and almost transparent worms with some 2mm to 4 mm in length. All dormant tubers shall be repotted every other year and inspected for these insects. An infestation can be detected for small bumpy warts on the outside of the tuber. These warts will eventually implode and leave behind a small mashy crater. This wound may be the entry site for a secondary bacterial and/or fungal infection. Unfortunately there is no reliable nematocide available for an use in a private collection. If such an infestation is detected, the best thing would be to throw

the entire pot (including the plant and the soil) away. For the rarer and hence pricier species, you may want to try to rescue the plant. However, an infested plant has to be kept in quarantine at all times and its pot should never get into contact with the open ground or a growing bench with other pots. Thoroughly wash the tuber removing any adherent soil. It may help to soak the tuber in some undiluted hypochlorite solution (standard bleach, wear some protective hand gloves for handling!) for some three minutes in order to remove some bacteria, fungal spores and nematodes from the tuber surface. Afterwards rinse the tuber thoroughly again with water to remove any remaining solution and let it dry a couple of days. After that repot the tuber using a new pot and fresh soil. Do not try to sterilize the old pot, but throw it away under all circumstances. Tuber offsets will inevitably be infested as well and these do not serve to regain a nematode-free stock. However, seeds, leaf bulbils and leaf cuttings are usually nematode-free, and this is the second-best option to rescue an infested plant. After successful propagation the mother plant shall be discarded as soon as possible.

## Plant & Seed Source

An extensive list of Amorphophallus and other aroid species is available here:



<http://www.rareplants.eu/shop>



<http://www.plantdelights.com>

At present we are propagating a very good selection of tuber-forming aroid species within the following genera: **Amorphophallus, Anchomanes, Ariopsis, Arisaema, Arum, Biarum, Colletogyne, Dracontium, Dracunculus, Gorgonidium, Helicodiceros, Pinellia, Pseudodracontium, Pseudohydrosme, Spathantheum, Taccarum, and Typhonium.**

**Plant Delights Nursery** is the best source of aroids and other exotic garden perennials in America. We have a large selection of Amorphophallus for sale, shipped as potted plants or dormant bulbs depending on season. You can buy a wide variety of aroids such as **Arisaema, Arum, Dracunculus, Elephant Ears, Pinellia, Philodendron, Sauromatum** and others. Visit our online plant catalog today to see all our new plants!