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Variegation: Adding Colours to the Life of Plants

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Abstract

The usual leaf colour of variegated plants is green with white stripes. The cells in the green sectors have chloroplasts that appear to be functioning normally, while the cells in the white sectors lack pigments and seem to be halted in different phases of chloroplast biogenesis. Mutations in the mitochondrial, chloroplast, or nuclear genes can result in variations. The genotypes of the green and white sectors differ amongst different plants, whereas in other plants they share a single (mutant) genotype.

Keyword- Chloroplast, mutation, variegation

Introduction

Variegation in plants refers to the presence of distinct colour zones on leaves, stems, fruit, or flowers. A variegated plant would therefore appear multi-tonal or two-toned. A plant's variegated areas can take the form of stripes, dots, circles, borders, and other patterns. Some plants have distinct variegated parts, while others may have their variegations merge slightly across sections, appearing more subdued, or completely take over the look of the leaf.

Fig 1.*Calathea lietzei* 'White Fusion

Any plant that develops patches of various colours in its vegetative sections is said to be a variegation mutant. In some of the more prevalent variations, the plant's ordinarily green tissues and organs include sections that are white (or yellow) and green. Cells in the white (or yellow) sectors have plastids that are lacking in chlorophyll and/or carotenoid pigments,

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while cells in the green sectors normally have chloroplasts that appear to be normal. These plastids usually lack organised internal membrane structures and/or have only primitive lamellae, suggesting that they have been photooxidized or inhibited at different stages of chloroplast formation.

Based on the genotypes of the white and green sectors, there are two main types of variegation. Gene mutations in the mitochondrial, plastid, or nuclear genome can result in these kinds of variegations. The first shows cells with wild-type (WT) genotypes in the green sectors and mutant genotypes in the white sectors.

In the second major type of variegation, the mutant cells all have the same mutant genotype, but only some of them express the mutant phenotype (white sectors). These kinds of variations are frequently brought on by nuclear recessive genes. A variegated plant's name will reveal whether it is a cultivar. The plant is a naturally occurring species if the second half of its Latin name contains the word variegata (lowercase, italics). The word "Variegata" (uppercase V, single quotation marks) in the plant's name denotes that it is a cultivar.

The natural variegation we see in many indoor plants today is the result of breeding. Natural patterning is accentuated and manipulated by growers, through selection and hybrid creation. The results are ‘cultivars’, not native plants as they would appear in the wild.

What causes variegation?

The absence of chlorophyll (the green pigment) in some plant cells is the root cause of variegation. Variegation still happens in plants whose main colour is not green because some of the plant cells lack pigment. Other prominent pigments like carotenoids, which are typically yellow to orange in colour, and anthocyanins, which are red to purple, may also be present in these plants. This has some incredible effects!

Rarely can variation arise naturally The majority of plants with variegations you encounter in nurseries and garden centres have been chosen for their individuality and beauty. This is due to the fact that a plant's variegation isn't very useful in the wild because it has less energy because it lacks chlorophyll (and plants need the energy to convert carbon dioxide and water into glucose).

There are numerous ways in which variations might develop. A few variations are not heritable; they are caused by outside factors. For example, preferential shade, disease invasion, and nutritional deficits can all result in chlorotic leaf sections. On the other side,

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heritable variations are caused by mutations in nuclear, plastid, and/or mitochondrial genes that prevent plastids from accumulating photosynthetic pigments, either directly or indirectly, leading to regions of the plant with cells that have white or yellow plastids. Occasionally, but not usually, the abnormal plastids are considered "permanently faulty."

Types of Variegation

1. **Chimeral Variegation**

The most prevalent type of variegation is chimaera. In this kind of variegation, which is brought on by a genetic mutation, a single plant has two different chromosomal make-ups, with one tissue able to synthesise chlorophyll and the other not. As a result, a plant with white or yellow zones mixed in with the solid green form is produced; this type of plant is known as a chimaera.

Fig 2.Monstera deliciosa 'Variegata'

2. **Pattern-Gene Variegation**

Some plants with variegation, also known as pigmented or natural patterning, aren't even mutants at all but rather have naturally occurring patterns.

Fig 3.Calathea sp

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This pattern can be seen in some of our favourite indoor variegated plants, and fortunately, unlike chimaera, this sort of variegation is encoded in the species' or cultivar's dna and passed on from parent to child. While a species may naturally exhibit some degree of variegation, producers frequently choose for patterning and develop hybrids to emphasise and manipulate this. The outcome is a plant variation known as a cultivar, which was developed through selective breeding and cultivated

3. **Blister or reflective variegation**

Blister variegation or reflected variegation are two further types of variegation that are frequently observed in our favourite houseplants. In this kind of plant, the lowest layers of the leaves, which are coloured, and the upper, which are not pigmented, generate tiny air spaces. These transparent spaces reflect light as it strikes them, giving the leaves a silvery look. However, this kind of variegation doesn't always appear symmetrically; for instance, blister variegation is also responsible for the sporadic spots on the leaves of scindapsus pictus (also known as satin pothos, .

We find reflecting variegation to be particularly appealing when it appears along the leaf veins. This is frequently observed in aroid plants like philodendrons, alocasias, and anthuriums. For instance, the leaf veins of philodendron gloriosum, alocasia frydek, and anthurium clarinerviumall exhibit reflective/blister variegation.

Fig 4.Anthurium clarinervium

4. **Viral variegation**

Some variegated leaves, like the mosaic virus, are genuinely brought on by viruses. Even though it's not very frequent, a virus can occasionally cause a desirable variegation that

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can be passed on to others. Even though they are not intended for indoor use, several hosta cultivars can exhibit this particular viral variegation.

Fig 5.Viral variegation

5. **Chemical variegation-**

To temporarily alter the colour expression of leaves, plant manufacturers can use chemicals and dyes. For instance, producers of the Pink Congo Philodendron fed the plant a chemical to temporarily stop it from producing chlorophyll, resulting in pink leaves. However, the chemical only lasted for 6 to 12 months before the leaves returned to their original green. The Pink Congo Philodendron caused quite a stir among gardeners. These expensive plants with lovely pink colours were offered without mentioning that the variegation was artificial and temporary.

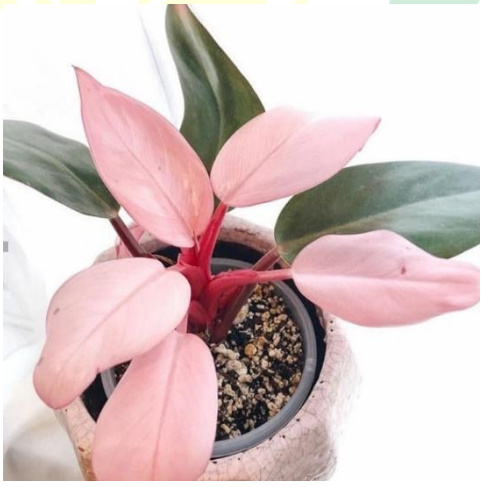

Fig 6.Pink congo philodendron

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