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## Plants Gone Crazy!:

### What is fascinating with fasciation?

*What occurs when a 'normal' growing plant suddenly develops 'abnormal', flattened stem growth? The condition is called fasciation, and in most cases it is caused by a genetic mutation.*

Wild and 'abnormal' stem growth is sometimes observed on a wide assortment of plant species and often 'prized' as ornamental character. This spring, we observed firsthand wild stem growth during a coleus trial evaluating over 100 cultivars at both the University of Kentucky and NC State University. We were surprised to find 'abnormal' growth on



Figure 1. A close-up of a fasciated, flattened stem on a coleus plant. Photo: Brian Whipker

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a plant we were growing in “tree-form” (topiary; Fig. 1). Growing coleus in a tree-form requires lower leaf and axillary shoot removal. A single shoot regenerated out of the lower stem region with a flattened stem (Fig. 2). This abnormal shoot growth of a flattened stem is referred to as fasciation.

### What is Fasciation?

Fasciation is the development of elongated, flattened stems in plants. It occurs in a wide assortment of species, such as this weed observed during a hike (Fig. 3), sweet potatoes (Fig. 4), and even cannabis (Fig. 5; see June 2021 Cannabis Business Times article, <https://www.cannabisbusinesstimes.com/magazine/>).



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Over the years plant scientists and breeders have been amazed by fasciation. In 1903, Lumina Riddle published in the Ohio Naturalist a list of 53 different species affected by fasciation. White (1945) reported on the biology of fasciation and provided a wide assortment of interesting photographs that highlighted distorted growth. Iliev and Kitin (2010) report that over 107 plant families have been observed to naturally develop fasciation symptoms. So being fascinated with fasciation has been going on for over 100 years.

In most cases, fasciation is not advantageous to the plant because flower development can be negatively affected. However as ornamental plant growers, we often see beauty in the unusual and fasciation can have highly prized ornamental attributes. Crested cockscomb (Fig. 6) is a common form of celosia grown in greenhouses or as cut flowers. In addition, cacti with fasciation stems are grafted onto rootstocks and sold as houseplants (Fig. 7).

### Causes of Fasciation?

Abiotic (non-infectious) factors such as a genetic mutation of the growing tip (meristems) are the primary cause of fasciation. A disruption of the plant’s meristem occurs as those cells multiply. This results in the production of elongated, flattened cells. These elongated cells continue to form as the plant grows into an obvious flattened stem. With genetically induced

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Figure 2. An abnormal shoot regenerated out of the lower stem of a coleus being grown as a tree-form. Photo: Brian Whipker

fasciation, usually, only one branch or stem is affected as observed in Fig. 1. That portion of the plant can be pruned out.

There are also other less common causes of fasciation that include chemical applications (Fig. 8a), damage to the growing tip by insect or animal feeding (Fig. 3; Fig. 8b), or mechanical injury (Fig. 8c). Distorted growth can also occur with a boron deficiency (Fig. 8d) and planting plugs too deep in the container (Fig. 8e).

Another biotic (infectious phytoplasmas) mimic that results in a proliferation of growth is caused by *Rhodococcus fascians*. *Rhodococcus* infections are reported on a number species such as geraniums (Fig. 8f), and a great resource about this disease can be found on the Oregon State University Plant Clinic website (<https://bpb.oregonstate.edu/plant-clinic/plant-diseases/rhodococcus-and-agrobacterium>).

## Conclusions

For greenhouse growers, fasciation can be a prized attribute. It occurs infrequently as we observed it on only 2 plants out of 3000 coleus we grew (0.067%), so it is an amazing discovery. As ornamental plant growers we are naturally curious about the abnormal growth, so it is to be expected that we are fascinated with fasciation.



Figure 3. In nature, fasciation can occur on weeds. Photo: Brian Whipker



Figure 4. A sweet potato plant that developed a fasciated stem. Photo: Brian Whipker



Figure 5. A broad, flat stem the developed out of terminal growth of cannabis. Photo: Brian Whipker



Figure 6. Crested celosia is a commercial example of fasciation grown by greenhouses and cut flower growers. Photo: Brian Whipker

## References

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Figure 7. The distortion of fasciation is a commercially desirable trait among the ornamental industry as seen here with a grafted cactus. Photo: Brian Whipker

## Fasciation Distorted Growth Mimics

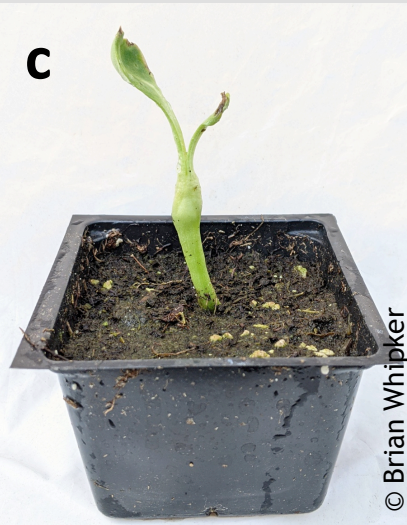


Figure 8. Distorted Growth Mimics of Fasciation.

- Herbicide drift can result in distorted growth on plants such as this tomato.
- In nature, insect feeding can result in weeds developing fasciated stems.
- Mechanical damage, such as loss of the growing tip during seed germination can result in distorted growth.
- A deficiency of boron can lead to distorted shoot growth.
- Transplanting plugs too deep can result in distorted shoot growth.
- Abnormal proliferation of cell growth with this scented geranium can result from the disease *Rhodococcus fascians*.



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