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Plant Epidermal Appendages: A Revisitation

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Abstract
Plant trichomes have many functions in their ecological niches. The premise of these structures are lacking to differentiate between their roles in different sweltering environmental conditions. The basis of this paper is to discuss the role of plant epidermal appendages, as well as, to provide plant examples related to their functioning. The importance of this contribution to be able to lineate the mystery behind the plants that possess plant epidermal appendages.

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There are many secrets possessed by plant epidermal appendages. The first mystery they have is that they are a structure which first forms contact with carbon dioxide (Johnson, 1975; Rawat et *al.,* 2024). Therefore, in their habitat, it can be found that plant epidermal appendages have a pivitol role in promoting a plants overall functioning (Johnson, 1975; Ehleringer, 1984). During seasonal changes, these epidermal appendages help plants cope and sustain themselves in the environment, and this doesn't matter whether the plant containing epidermal appendages is an ornamental, is floral, or edible. It has been found that during windy conditions, plants containing these appendages are flubbery, or stiff, and this is attributed to the plant epidermal appendages containing cytoplasm and being nuclear. The cytoplasm within trichomes (herein referred to as plant epidermal appendages) have emerged from the evolution of protoplasm during trichome growth. Hence, the contact of different plant species with the environment is a unique feature of the evolution and diversification of plants. Ali and Al-Hemaid (2011), Duffey (1986), Tooker *et al*. (1986) have reported that this specificity found in trichomes is attributed to the basal cells that they possess.

The shape, size and arrangement of each plant epidermal appendage is different between different species of plants having them. The arrangement of the trichomes account for being

an important characteristic that controls temperature and photosynthetic homeostasis in the plant. The epidermal appendages have an indirect control over photosynthesis by protecting photosystems, thylakoid membranes and even grana. For example, on the surface of *Fragaria species* plants, trichomes scattered on the leaf surfaces enable the protection of photosynthesis. Additionally, these epidermal appendages do not play a significant role in water conductivity of plants, in general. However, they do help maintain the function of xylem (water-conducting) and phloem (food-conducting) tissues within the plant tissue, though this is attained through the plant's ecological roles in the environment. In *Cucurbit species*, also known as the pumpkin, the trichomes offer a third element of protection to the vines because they are spine-like. It's obvious from this that only small creatures, viz. ants and mites, would have access to feed on the water-filled and crunchy stems of this creeper. The physical element of growth in pumpkin and butternut plants - *Cucurbita moschata* - is provided by trichomes. In the mentioned plants, gravitational pull provided by the hair-appendages enable the plants to remain on the ground. Singh (2017) stated that the roles of epidermal appendages co-insides with their ecological functions, however, there is much more roles that are not reported.

Singh (2017) states that tichomes are known to assist forestry experts. For instance, during field experiments, plant explorers may use trichomes as a guide to finding their way back to where their started exploring. During cold conditions, such as during frosty or snowy weather, the hair-like structures are known to provide warmth and keep the plants injure-free. In addition, they offer shade to plants during extreme weather conditions (Tooker *et al.,* 2010; Kesslet and Baldwin, 2002). Hence, trichomes enable there to be homeostatic control of sodium and potassium gradients during night and day temperature fluctuations (Singh, 2017; Singh, 2024). Duffey (1986), Tooket *et al.* (2010), Kesslet and Baldwin (2002) and Wagner *et al*. (2004) have stated that trichomes are an advanced feature of plant development, particularly because they provide a resistance to danger which a plant may encounter in the ecological niche.

Duffey (1986) states that trichomes make animals frightened in farms and the field by provoking fear in them. In this way, plants possessing trichomes are protected, in that, these outward protrusions protect these plants from being eaten by herbivores and omnivores. In this manner, natural selection through herbivory and omnivory is prevented, since plant epidermal appendages have this role (Singh, 2017). From this, it can be concluded that plant epidermal appendages assist plants in maintaining their longevity, particularly in the wild. It must also be mentioned that although this is a common feature of plant trichomes, they also offer protection to flowers. For example, this is the case in plants that have trichomes on the bud calyces. In this way, pollination and seed dispersal can take place, and the plants possessing trichomes can develop properly in the habitat (Singh, 2017; Singh, 2024). *Actinidia deliciosa*, the kiwi, has trichomes present on the fruit of the plant. Here, the epidermal appendages protect the fruit from not only herbivory, but also fruit forages by amourflaging the fruit (Singh, 2017). Hopefully after reading this, you have gained valuable insight into the miracles offered by plant trichomes.

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