

Non-Confidential Description - PSU No. 2140
“Compositions and Methods for Regulating Abscisic Acid-Induced Closure of Plant Stomata”

Keywords:

Molecular biology of plants, gas exchange, transpirational water loss

Links:

[U.S. Patent 7,211,436](#)

[Inventor website](#)

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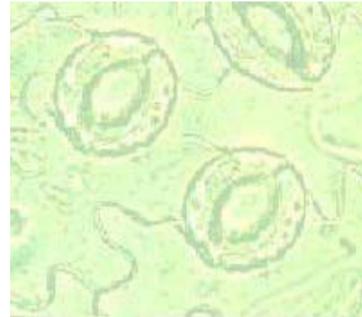


Figure 1. Stomatal complexes in *Vicia faba*

Background

Transpiration is the evaporation of water from the leaves of plants. The loss of water from the leaves lowers their osmotic pressure, and draws minerals and water from the stem, roots, and soil. Stomata simultaneously regulate both the transpiration of water and the exchange of gases for photosynthesis. Open stomata allow for the maximum gas exchange rate so that photosynthetic reactions proceed more quickly; however, these conditions cause maximal water loss. On the other hand, closed stomata minimize water loss but also substantially reduce photosynthetic reaction rates.

Controlling stomatal response thus has several advantages. Crop yield could be increased, or the time to plant maturity could be decreased through stomatal opening. Additionally, plants such as corn and wheat could be dried quickly at the end of the growing season, minimizing exposure to adverse weather conditions. Stomatal closure could prevent produce from drying out. For fruits, vegetables, and cut-flowers, slow drying helps retain freshness during transport, distribution, and purchase of the product. This could significantly extend the shelf life of the product. So, it would be advantageous to precisely control the plant's transpiration and photosynthesis rate via the stomata.

Invention Description

Certain factors influence the stomata: light conditions, relative humidity of the air, temperature, water status of the plant, CO₂ concentration, relative concentration of certain ions, and concentration of abscisic acid (ABA). ABA regulates the ion and water content of the pair of guard cells that flanks each stoma, which opens or closes the stomata depending on water availability. If water is plentiful, the stomata open, if water is in short supply, the stomata close to prevent water loss.

The disclosed invention is a novel gene, AAPK, which regulates the plant's response to Abscisic acid. Loss of function of the protein encoded by AAPK is associated with reduced sensitivity to abscisic acid induced stomatal closure in plants. Also disclosed are transgenic plants and mutants having altered sensitivity to abscisic acid mediated transpiration and other desirable agronomic features.

Advantages/Applications

- Increases crop yield while decreasing maturity time for crops
- Increases Freshness during transport, distribution, and purchase
- Minimizes time needed to dry out crops like corn and wheat

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