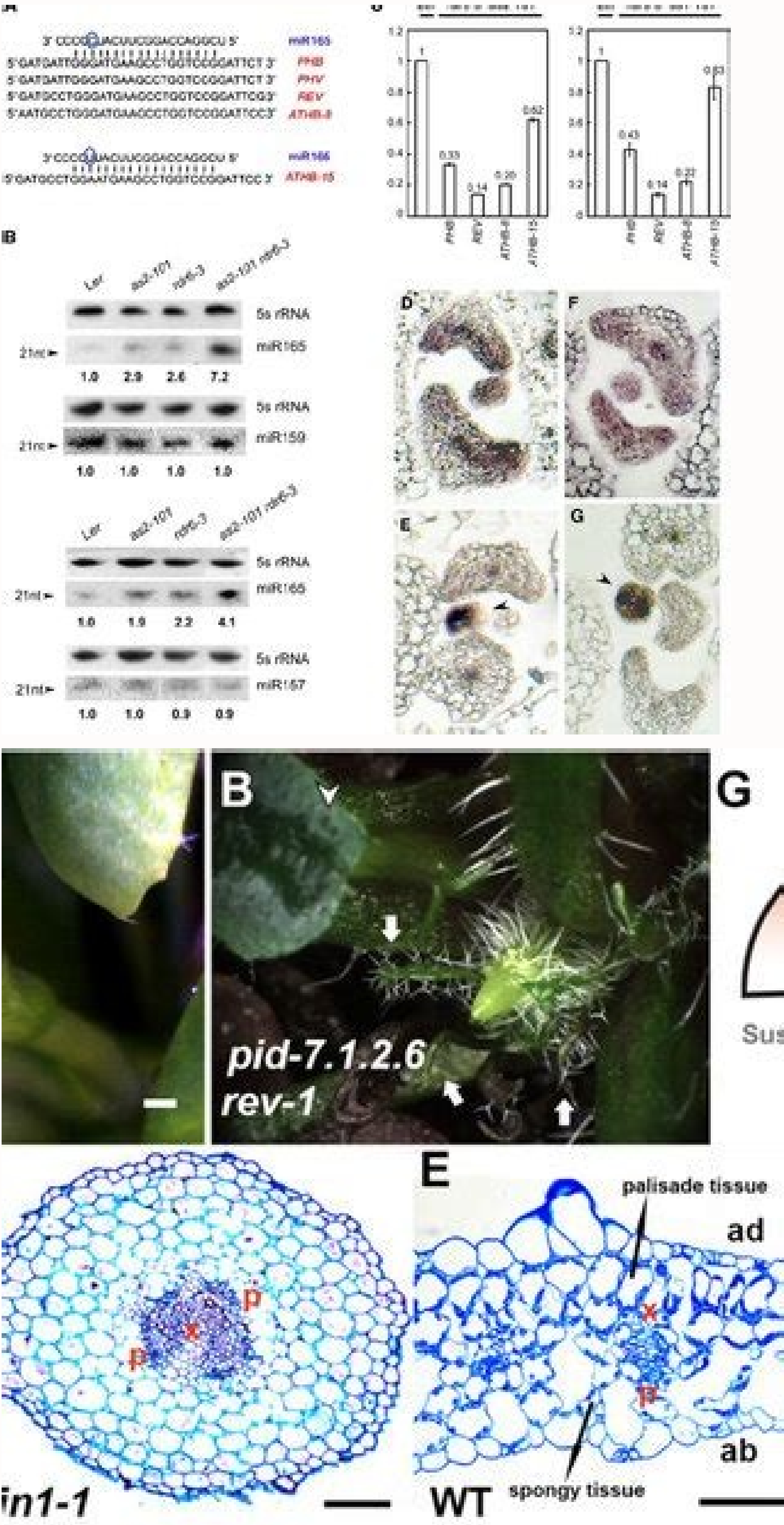


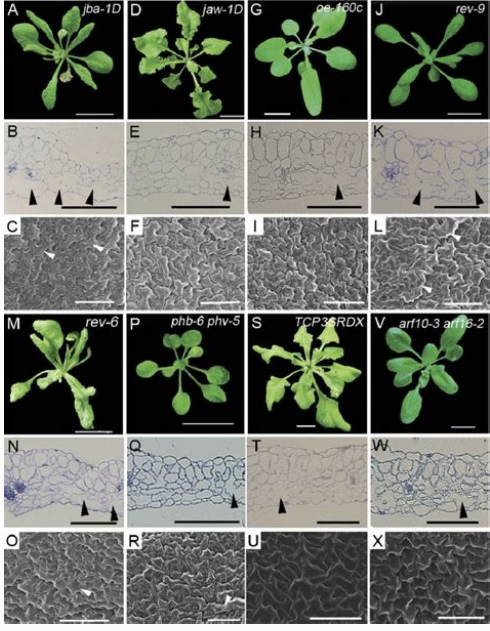
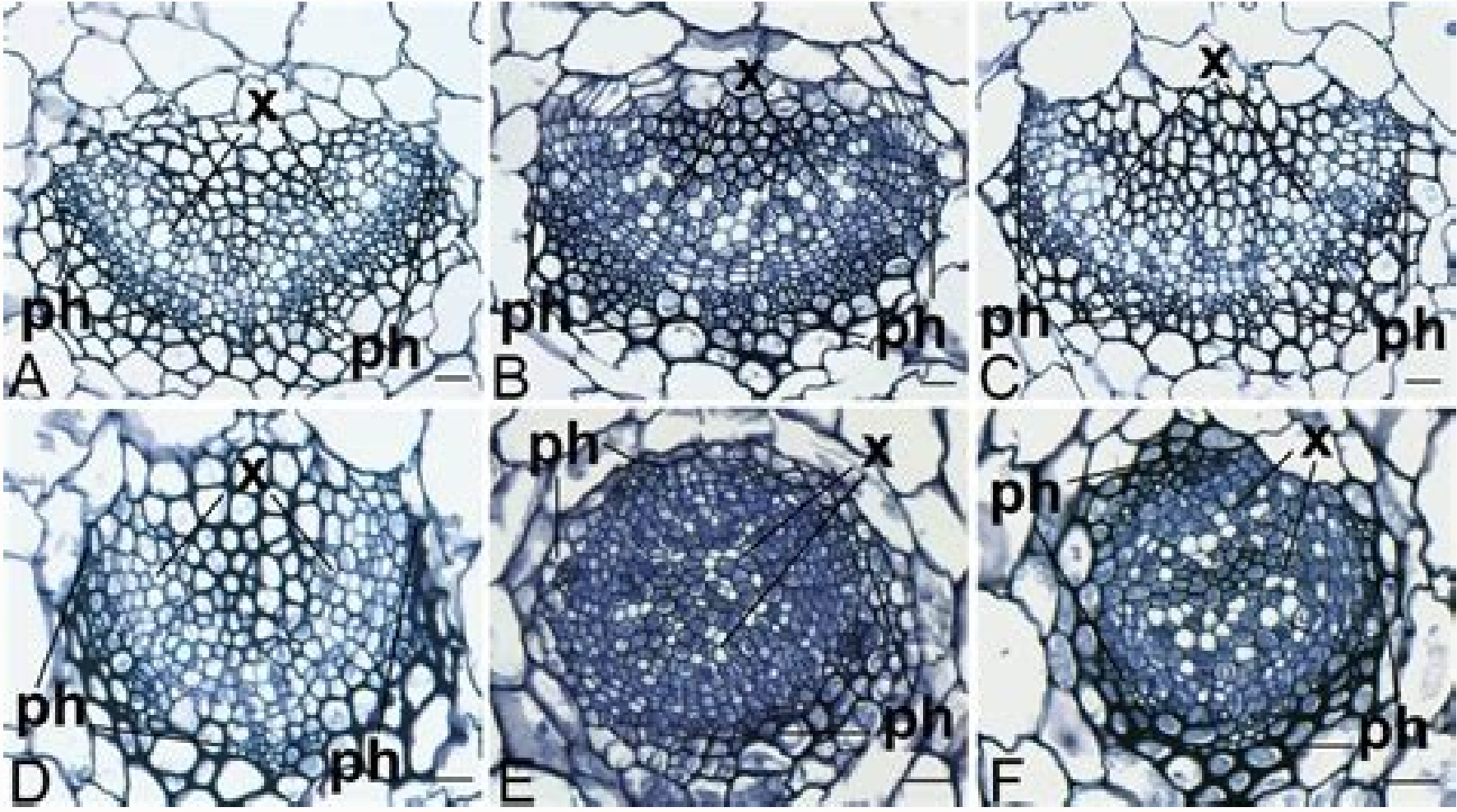
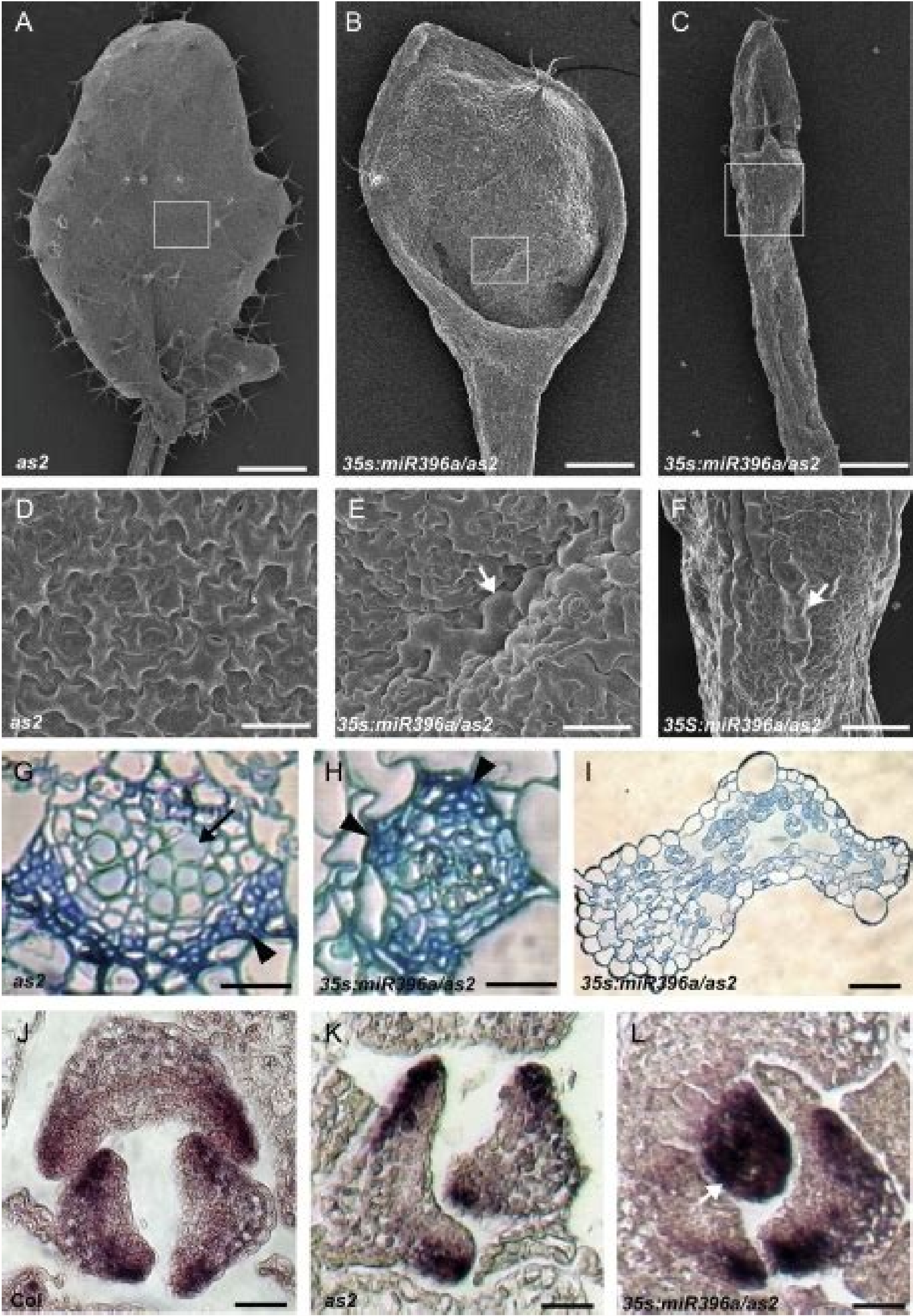
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Adaxial-abaxial polarity formation.

The creation of adaxial-abaxial polarity is essential for the development of lateral organs. A stamen consists of a bilaterally symmetrical anterior and a radial filament. Using a rice mutant, a slogan similar to the rod, in which the adaxial-abaxial polarity establishment is committed, we find that it is likely that the stamp of the guideline is reached by a unique regulatory mechanism: reorganization of adaxial-abaxial polarity In the venty, and abaxialization in the filament. These regulations are not found in the development of leaves. Here, we discuss similarities and differences between the stamen and the leaf in the mechanisms underlying the establishment of adaxial-abaxial polarity. In addition, we propose the idea that it is likely that the process of establishing adaxial-abaxial polarity in the lateral organs is divided into two phases: a meristem-dependent, followed by a meristem-independent phase. In the development of stamens, the transition between these two phases is clearly observed as the reorganization of the expression patterns of adaxial and abaxial marked genes. The establishment of polarity along the development axes is a fundamental process in the development of lateral organs in the plants. The regulation of adaxial-abaxial polarity is well understood in the development of leaves. 1.2 Both in Arabidopsis and in MAÄZ, it is known that several transcription factors and small RNA are a complex genetic network that regulates the establishment of polarity on the leaf. On the contrary, the mechanism that controls adaxial-abaxial polarity in the development of stamens is not as well understood. We have analyzed the mutant of the slogan (role) similar to rice rod, in which the stamen and motto have defects in the establishment of adaxial-abaxial polarity.3 In the role, some stamens and lemmas are developed in structures similar to pin or bars, respectively, that are associated with the of polarity. Role phenotypes are caused by a weak mutation in the SHOOTLESS2 gene that encodes a protein similar to ARNA-DEPENDENT RNA POLYMERASE6, which is necessary for theof a small RNA transformation interferent (TA-SIRNA).4 When analyzing the ROL mutant and the spatial expression patterns of the adaxial and abaxial markers, we proposed a model of the regulatory mechanism that underlying the establishment of the adaxial-abaxial polarity in the stamen in Rice.3 In this model, adaxial-abaxial polarity is reorganized at an early stage during the development of before, while adaxial identity is completely lost in the filament. Although this model is inferred from rice studies, published Arabidopsis research tells us that the mechanism we proposed is applicable to the development of stamens in general angiosperms.5 *8 In this appendix, we discuss similarities and differences between stamen and leaf. In the mechanisms underlying the establishment of adaxial-abaxial polarity. In addition, we also discussed two phases of polarity establishment, namely, phases dependent on meristems and independent meristhes, in the development of lateral organs. In the development of leaves, the adaxial-abaxial polarity is established early, at a stage when the primordium leaf does not yet exhibit Any morphological difference between the adaxial and abaxial domains. However, polarity can be recognized by the expression patterns of adaxial or abaxial identity genes (Fig. 1A). 6,9 *11 Once the adaxial-abaxial polarity is established, the polarity does not change and the development destinations of the cells, such as epidermal cells and vascular tissue cells, are specified depending on this polarity. In addition, the establishment of adaxial-abaxial polarity is required for the flat growth of the leaf: that is, laminar growth occurs in the region of the union between the adaxial and abaxial domains.12 *The failure in the establishment of the polarity results in the radialized leaves, which are either adaxialized or abaxialized.of the genes that are committed. In the development of stamens in rice, the adaxial-abaxial polarity is initially established, as it is on the leaf: OSPHB3, an adaxial identity gene (one (one)of Arabidopsis PHBULOSA), is expressed in the domain adjacent to the meristem; and an abaxial identity gene, OsETT1N1 (OsETT1), is expressed in the domain opposite to it (Fig. 1B).3 In another development, however, there is a marked rearrangement of the spatial expression patterns of the adax genes. Abaxial and Abaxial. After this rearrangement, OSPHB3 is expressed in the lateral regions of the anther primordium, while OsETT1 is expressed in a region close to the meristem, in addition to its original abaxial region. The new polarity seems to establish itself in a new development unit, theca primordium, and subsequent development is probably associated with the new polarity. Four growths are formed in border regions between the two domains expressing the genes of adaxial or abaxial identity, and these growths are subsequently differentiated into pollen sacs. The stomach is formed in the adaxial domain, while the connective tissue is differentiated in the abaxial domain of theca. In contrast, the expression of OsPHB3 is lost in the outer layers of the filament, suggesting that the filament is abaxialized (Fig. 1B). Thus, the anther and the filament are formed and differentiated according to the different polarities.Therefore, in comparison with foliar development, the establishment of the adaxial-abaxial polarity is markedly different in the staminal development: i.e., independent establishment of the polarity in the distal and proximal regions, rearrangement of the polarity in the anther and complete abaxialization of the filament. Despite these differences, it is likely that the development of stamens is regulated by a mechanism similar to the underlying foliar development. On the leaf, the foil bumps form at the adaxial-abaxial edges. Similarly, in the anther, the derived growths that differ in the pollen sacs emerge in the border regions between the adaxial identities abaxial. consistently, the pollen bags are lost partially or totally in themutant.3 In filament development, the Primordium filament is completely abaxialized and develops into a radialized structure. This developmental pattern is very similar to the formation of a radialized leaf caused by failure of laminar overpass in mutants in which the adaxial or abaxial identity is completely compromised. 7,12,13 Flower organs, including stamen evolved from the leaf.16,17, therefore, these The similarities in the establishment of the adaxial-abaxial polarity are consistent with the evolutionary origin of stamen. To make a filamentous structure of the blade flattened, abaxialization could have been introduced during the evolution of the stamen. The rearrangement of the adaxial-abaxial polarity could also have been adopted to elaborate the complex structure of the anther, which is composed of two tons, and the connection experiments. They suggest that a meristem signal is required for acquiring adaxial identity on the leaf. Development.18,19 When an incipient Primordium (I1 or P0) was isolated by meristem incision, the primordium formed a radially symmetrical structure with abaxialization (Fig. 2a). Conversely, when the incision was made at the P2 stage of leaf development, the leaf normally developed without disturbance of the adaxial-abaxial pattern.18 *20 Thus, the meristem signal is required for a short development window, suggesting that leaf development can be divided into two parts. in two phases: a MERISTEM-dependent phase and a meristem-independent phase. That is, after the transition of the meristem-dependent phase, it is probable that the establishment of adaxial-abaxial polarity is regulated autonomously by organs. In an early stage of stamen development, the OSPHB3 adaxial marker is expressed in the domain adjacent to The meristem, while the OsETT1 abaxial marker is expressed in the domain to her. This step would correspond to the Meristem-dependent phase that is described above. Subsequently, the expression patterns of and OsETT1 changes drastically. For example, the OsETT1 abaxial marker is expressed in the domain adjacent to the meristem. This probably indicates that the development of the first-hand stamen is likely to be free from a sign of meristem putative. Therefore, the reorganization of polarity in the apex is likely to be associated with the transition from the phase dependent on the meristem to the meristem-independent phase (organ-autonomous). Abaxialization in the development of the filament also seems to be an indication of an organ-autonomous phase. Once established on the sheet, the adaxial-abaxial polarity is maintained and does not change anymore. Therefore, the transition between the two phases would be difficult to distinguish by the expression patterns of the marking genes (Fig. 2B). On the contrary, the marked reorganization of the adaxial-abaxial polarity can be detected by changes in the gene expression pattern in the development of stamens. This reorganization provides visible evidence that the lateral organ probably has two distinct phases in the establishment of the adaxial-abaxial polarity so it passes from a phase dependent on meristem to an organ-autonomous phase. Addendum to: Chitwood DH, Nogueira FTS, Howell MD, Montgomery TA, Carrington JC, Timmermans MCP. Pattern training through small RNA mobility. 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