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THE *REGULATOR OF AXILLARY MERISTEM FORMATION* GENE CONTROLS VEGETATIVE AND REPRODUCTIVE ARCHITECTURE IN SUNFLOWER

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During post-embryonic development, the complexity of aerial architecture is created to a large extent by the branching patterns. Shoot branching involves the formation of axillary meristems (AMs) in the axil of leaves and subsequent outgrowth of the buds. AM initiation and outgrowth are responsible for producing every secondary axes of growth, including inflorescence branches or flowers. Although at first glance the floral meristems (FMs) bear little resemblance to axillary buds, the two are apparently homologous structures. In many species the FM develops with a subtending leaf-like bract, suggesting that the FM is a modified AM, as also suggested by some similarities in gene expression. In sunflower, the *missing flowers* (*mf*) mutant is defective in axillary shoots differentiation. In addition, in the *mf* plants ray flowers are absent and only a few plants are able to differentiate a very reduced number of disk flowers. In wild type sunflower a bisecting crease divides each floret primordium into two distinct bumps that adopt different fate. The peripheral (abaxial) portion of the primordium becomes a small leaf-like bract and the adaxial portion becomes a flower. Histological analyses show that in floret primordia of the mutant a clear subdivision in dyads is not established. The primordia progressively bend inside and only large involucral floral bracts are developed. The resulting head is wholly composed of enveloping floral bracts in most mutant plants. Hence, the distinctiveness of the *mf* mutant was the contemporary missed development of meristems that arise in the axils of leaves as well as on the flanks of the inflorescence meristem. Notably, *in situ* analysis shows that the transcription of *REGULATOR OF AXILLARY MERISTEM FORMATION–LIKE* of sunflower (*Ha-ROXL*) is strongly restricted to a small domain within the boundary zone separating the SAM from the leaf primordia and in restricted regions of the inflorescence meristem, beforehand the separation of floral bracts from disc flower primordia. These results suggested that *Ha-ROXL* may be involved to establish a cell niche for the initiation of AMs as well as flower primordia. We report that the *mf* phenotype is related to a point mutation in the *Ha-ROXL* gene that generate a stop codon in the coding region. Virus-induced gene silencing (VIGS) vectors developed from *Tobacco rattle virus* (*TRV*) has been tested to validate the co-segregation analysis.