

Abstract

Sesame (*Sesamum indicum* L) is an important oilseed crop and has a high economic value in developing country like India. However, it is increasingly evident that the small scale farmers of the developing countries losing their interest to cultivate sesame due to its very low productivity. Thus increasing the productivity of the sesame is of prime importance in the present scenario. In recent years, it is evident that the most successfully adopted method to increase the productivity of the crop is through exploitation of heterosis or hybrid vigor. Hybrid plants have great advantages like higher yield and better disease resistance than parents. The male sterility system carries immense significance in realizing the hybrid vigor to exploit heterosis specifically in the self-pollinated crop plants like sesame. Cytoplasmic male sterility (CMS) and nuclear male sterility (NMS) are two common methods utilized to generate the male sterile plant for hybrid seed production. Although CMS is widely used for production of hybrid seed, the cytoplasmic male sterile sesame lines have not yet identified in natural sesame population, and therefore, genetic elements that could be responsible for this are unknown. Thus, NMS could be the better approach to generate male sterile sesame line. To develop NMS lines, information on the anther specific promoter as well as gene are extremely important. Therefore, in the present study, an anther specific β -1, 3-glucanase gene (*SiAG*) of sesame has been isolated, cloned and characterized. We also found that the expression of *SiAG* gene was restricted in meiosis to free microspore stage of the anther development of sesame. Moreover, isolated promoter element of the *SiAG* gene showed tapetum-specific expression in a GUS-reporter assay in transgenic tobacco. Similarly, we also profiled the expression pattern of *Arabidopsis thaliana* A9 promoter through GUS reporter assay. We found that the A9 promoter was active in tapetal cells from very early stage (before meiosis) of anther development whereas *SiAG* promoter was active from meiosis of microsporogenesis. Transgenic expression of the *SiAG* gene at early meiosis stage under tapetum-specific A9 promoter of *Arabidopsis* in tobacco plants resulted sterile pollen grains. Thus the present strategy using *SiAG* under A9 promoter holds great promise for the development of nuclear male sterile sesame line through genetic engineering approach in the future.

Keywords: *Sesamum indicum*; Male sterility; Anther specific β -1, 3-glucanase; Tetrad; Microspores; Pollen grains; Tapetum-specific A9 promoter; Transgenic tobacco plant.