Accepted Manuscript

Mapping a leaf senescence gene els1 by BSR-seq in common wheat

Miaomiao Li, Beibei Li, Guanghao Guo, Yongxing Chen, Jingzhong Xie, Ping Lu, Qiuhong Wu, Deyun Zhang, Huaizhi Zhang, Jian Yang, Panpan Zhang, Yan Zhang, Zhiyong Liu

PII: S2214-5141(18)30019-9
DOI: doi:10.1016/j.cj.2018.01.004
Reference: CJ 276

To appear in:

Received date: 27 November 2017
Revised date: 22 January 2018
Accepted date: 14 February 2018

Please cite this article as: Miaomiao Li, Beibei Li, Guanghao Guo, Yongxing Chen, Jingzhong Xie, Ping Lu, Qiuhong Wu, Deyun Zhang, Huaizhi Zhang, Jian Yang, Panpan Zhang, Yan Zhang, Zhiyong Liu , Mapping a leaf senescence gene els1 by BSR-seq in common wheat. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Cj(2018), doi:10.1016/j.cj.2018.01.004

Mapping a leaf senescence gene *els1* by BSR-seq in common wheat

Miaomiao Li[a], Beibei Li[b,c], Guanghao Guo[b,c], Yongxing Chen[b], Jingzhong Xie[b], Ping Lu[b], Qiuhong Wu[b], Deyun Zhang[a], Huaizhi Zhang[b,c], Jian Yang[b], Panpan Zhang[b,c], Yan Zhang[d], Zhiyong Liu[b,*]

[a] College of Agronomy & Biotechnology, China Agricultural University, Beijing 100193, China

[b] State Key Laboratory of Plant Cell and Chromosome Engineering, Institute of Genetics and Developmental Biology, Chinese Academy of Sciences, Beijing 100101, China

[c] University of Chinese Academy of Sciences, Beijing 100049, China

[d] College of Horticulture, China Agricultural University, Beijing 100193, China

Abstract: Leaf senescence is normally the last stage of plant development. Early senescence of functional leaves significantly reduces the photosynthetic time and efficiency, seriously affecting grain yield and quality in wheat. Discovering genes responsible for early leaf senescence (*els*) are necessary for developing novel germplasms and cultivars with delayed leaf-senescence through molecular manipulation and marker assisted selection. In this study, we identified an early leaf senescence line M114 in a derivative of a wheat breeding population. Genetic analysis indicated that early leaf senescence in M114 is controlled by a single recessive gene, provisionally designated *els1*. By applying bulked segregant analysis and RNA-Seq (BSR-Seq), seven polymorphic markers linked to *els1* were developed and the gene was located on chromosome arm 2BS in a 1.5 cM genetic interval between markers *WGGB303* and *WGGB305*. A co-segregating marker, *WGGB302*, provide a starting point for fine mapping and map-based cloning of *els1*.

Keyword: Bulk segregant analysis; Genetic mapping; Leaf senescence; *Triticum aestivum*

1. Introduction

Leaf senescence, an orderly regulated and active process, is the last stage of leaf development. During this process, plant organs, and cells undergo a sequence of complex changes in cellular physiology and biochemistry, and nutrients are redistributed to the sink tissues, such as developing fruits and seeds [1, 2]. Crops with delayed leaf senescence or stay green maintain extended periods of photosynthetic competence and have higher seed weights and grain yields [3, 4]. However, premature senescence of functional leaves during grain filling results in reduced yield and quality, on account of disrupted physiological function in leaves due to reducing transport of photosynthetic products from leaves to seeds and a shortened period for grain filling [5].

The onset and progression of senescence can be modulated by a variety of environmental signals including drought, nutrient limitation, light, and various plant hormones. Drought stress decreases crop yields by inducing abscisic acid (ABA) and premature leaf senescence in barley [6]. A delay in leaf senescence results in delayed N remobilisation and a negative impact on protein deposition in the grain, thus reducing grain quality [7]. H_2S suppresses chlorophyll degradation of detached *Arabidopsis* leaves in dark-induced leaf senescence [8]. Plant hormones play key roles in response to senescence. ABA can induce expression of several senescence-associated genes (SAG) in *Arabidopsis thaliana* [9]. Exogenous ethylene enhances visible leaf yellowing and several

* Corresponding author: Zhiyong Liu, E-mail address: zyliu@genetics.ac.cn.

Received: 2017-11-24; Revised: 2017-01-22; Accepted: 2018-02-14.