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RESEARCH ARTICLE

Identification of commercial cultivars of *Agaricus bisporus* in China using genome-wide microsatellite markers



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Abstract

Agaricus bisporus is one of the most widely cultivated mushrooms in the world. Commercial cultivars are usually phenotypically alike and easy to be copied by isolating tissue cultures. This brings great challenges to distinguish different cultivars and to protect new varieties. Thus, techniques for the accurate identification of cultivars are essentially required. In this study, we accurately identified 11 commercial cultivars of *A. bisporus* released in China by using microsatellite (SSR, simple sequence repeat) markers. SSR markers were developed by mining the genome sequence. A total of 3 134 SSRs were identified, of which 1490 SSRs were distributed in gene models, and 1644 in the intergenic regions. A total of 17 polymorphic primer pairs were developed and SSR fingerprints were constructed for all the commercial cultivars. These SSR markers generated a total of 73 alleles, with an average of 4.29 per locus. Specifically, the primer combination of AB_SSR_2341 and AB_SSR_2590 could distinguish all the 11 commercial cultivars. The similarity coefficients of the 11 commercial cultivars were between 0.56 and 0.95 indicating that some of them were close related. Our results provide an efficient technique for the identification of *A. bisporus* cultivars in China, which can also facilitate the marker-assisted breeding in the future.

Keywords: *Agaricus bisporus*, SSR, strain identification, fingerprint

1. Introduction

Agaricus bisporus (Lange) Imbach (button mushroom) is a widely cultivated mushroom known for its significant economic value and abundant nutritional and medicinal functions (Beelman *et al.* 2003; Li *et al.* 2015). Recently,

the production of button mushroom has increased due to the increasing number of producing countries (Staniaszek *et al.* 2002; Zhang *et al.* 2014) and the improving cultivation techniques (Sonnenberg *et al.* 2016). China is the largest producer of button mushrooms. The total production output of button mushrooms was 3.35 million tons in 2016, according to the data from China Edible Fungi Association (<http://mushroomsci.org/html/001/abfe8d1b-b.html>). Superior variety is key to the yield and quality of mushroom production. However, numerous non-authorized cultivars have been produced in China as mushroom varieties are easily copied by methods such as isolating tissue cultures (Foulongne-Oriol *et al.* 2011; Liu *et al.* 2016). Unfamiliarity with intellectual property rights and the demand of reducing production costs of producers have aggravated the problem. Thus, rapid and accurate identification techniques are

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