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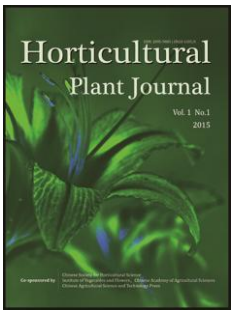

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PII: S2468-0141(17)30150-4
DOI: http://dx.doi.org/doi: 10.1016/j.hpj.2017.06.003
Reference: HPJ 61

To appear in: *Horticultural Plant Journal*

Received date: 2-10-2016
Revised date: 7-12-2016
Accepted date: 3-1-2017

Please cite this article as: CUI Qiaoyun, NI Xinghong, ZENG Liang, TU Zheng, LI Jin, SUN Kang, CHEN Xuan, LI Xinghui, Optimization of Protein Extraction and Decoloration Conditions for Tea Residues, *Horticultural Plant Journal* (2017), http://dx.doi.org/doi: 10.1016/j.hpj.2017.06.003.

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Optimization of Protein Extraction and Decoloration Conditions for Tea Residues

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Received 2 October 2016; Received in revised form 7 December 2016; Accepted 3 January 2017

Available online date

Abstract

To optimize alkaline method for extracting proteins from tea residue (TR), the effect of extraction conditions on tea protein extraction rate (TPER) was investigated. Single factor experiment showed the extraction temperature 80 ℃, extraction time 100 min, pH value 13 and liquid-solid ratio 40:1 was the optimal extraction condition. The orthogonal test revealed that the maximum TPER reached 29.71% under the following optimal combination of conditions: extraction temperature 70 ℃, extraction time 60 min, pH 12 and liquid-solid ratio 50:1. For optimizing the purification of tea residue proteins, isoelectric point precipitation (pI), ammonium sulfate precipitation (aS) and isoelectric point plus ammonium sulfate precipitation (iPAS) were compared. The result showed that the highest protein precipitation rate (PPR) was 89.70% which generated by using iPAS. Furthermore, powdered activated carbon was chosen as the most suitable decolorant for the extracted proteins.

Keywords: tea protein; alkaline extraction; protein precipitation; protein decoloration

1. Introduction

Tea deep processing is an important use of machine-harvested fresh tea leaves and generates a lot of residues (Chen et al., 2012). Underutilized tea leaves resulted in a waste of resources and environmental pollution (Zhang et al., 2015). According to an existing report (Demir, 2006), tea residue (TR) contains 1%–2% polyphenols, 0.1%–0.3% theanine, 16%–18% crude fiber and 17%–19% crude protein. Crude protein can be used for preparation of polypeptide by hydrolysis. Through observation of hydroxyl radical, the produced polypeptide may have potential values (Olasehinde et al., 2012). For examples, it can be used as feed (Kondo, 2004), fertilizer, adsorbent material (Amarasinghe and williams, 2007), new solid phase support (Sharma et al., 2008) and so on.

In general, aqueous and organic solution extraction methods are used for protein extraction of plants. Aqueous solution extraction method (including salt, acid and alkali solutions) is usually used because of its large solubility and benefit for protein stability. For lipid binding protein and proteins with many nonpolar side chains, the organic solvent extraction method displayed its advantages, because the organic solutions such as ethanol,

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