豬血紅蛋白之酵素水解及抗氧化活性研究

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摘 要

本研究以豬血紅蛋白為材料，探討以Alcalase 與Flavourzyme水解前後之抗氧化活性。抗氧化活性測定項目，包含還原力、亞鐵離子螯合能力及DPPH自由基清除能力等三種，並與BHA、α-生育醇或ETDA之抗氧化性做比較。 結果發現未經酵素水解處理之豬血紅蛋白不具還原力，但在亞鐵離子螯合能力方面，則隨濃度之增大而有增加的趨勢，於濃度5.0 mg/mL 時，具有74.46 %之螯合亞鐵離子能力；在DPPH自由基清除能力方面，於濃度2.0 mg/mL時，其清除自由基能力為21.53 %。使用Alcalase和Flavourzyme兩種蛋白質水解酵素對豬血紅蛋白進行水解之水解度變化方面，使用Alcalase水解豬血紅蛋白10小時後，得到水解度為9.84 %；使用Flavourzyme者，可得到18.75 %之較高水解度，約為使用Alcalase者之1.91倍。在使用Alcalase和Flavourzyme進行兩階段水解之水解度中，以單一2.0 % Alcalase進行10小時水解作用，所得到水解度遠比使用2.0 % Alcalase進行水解4小時後，再加入0.5、1.0與2.0 % Flavourzyme進行2、4、6小時水解得到之水解度要來的低。 在豬血紅蛋白水解物之抗氧化活性中，其還原力並不顯著，但其亞鐵離子螯合能力則隨濃度之增大而有增加的趨勢，以2.0 % Alcalase水解4小時後再經1.0 % Flavourzyme水解6小時所得豬血紅蛋白水解物具有最強之亞鐵離子螯合能力，於樣品重對溶劑體積比值濃度為5.0 mg/mL時，具有63.54 %之螯合亞鐵離子能力；在DPPH自由基清除能力方面，以2.0 % Alcalase水解4小時所得豬血紅蛋白水解物，其對DPPH自由基清除效果較佳，於樣品重對溶劑體積比值濃度為5.0 mg/mL時，具有41.94 %的清除自由基能力。將豬血紅蛋白水解物，進行膠體過濾層析，並將層析圖所有尖峰分成三個不同蛋白區分，然後與抗氧化活性進行相關性分析，結果顯示水解物之抗氧化活性與Fraction Ⅰ含量呈現顯著之正相關，而與FractionⅢ含量呈顯著之負相關。 綜合本研究之結果，可知豬血紅蛋白與其水解物具有亞鐵離子螯合能力，部分豬血紅蛋白水解物具有清除DPPH自由基能力，故可做為開發天然抗氧化劑之參考。

關鍵詞 : 豬血紅蛋白 ; 抗氧化性 ; 還原力 ; 亞鐵離子螯合能力 ; DPPH自由基清除能力 ; 酵素水解

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