



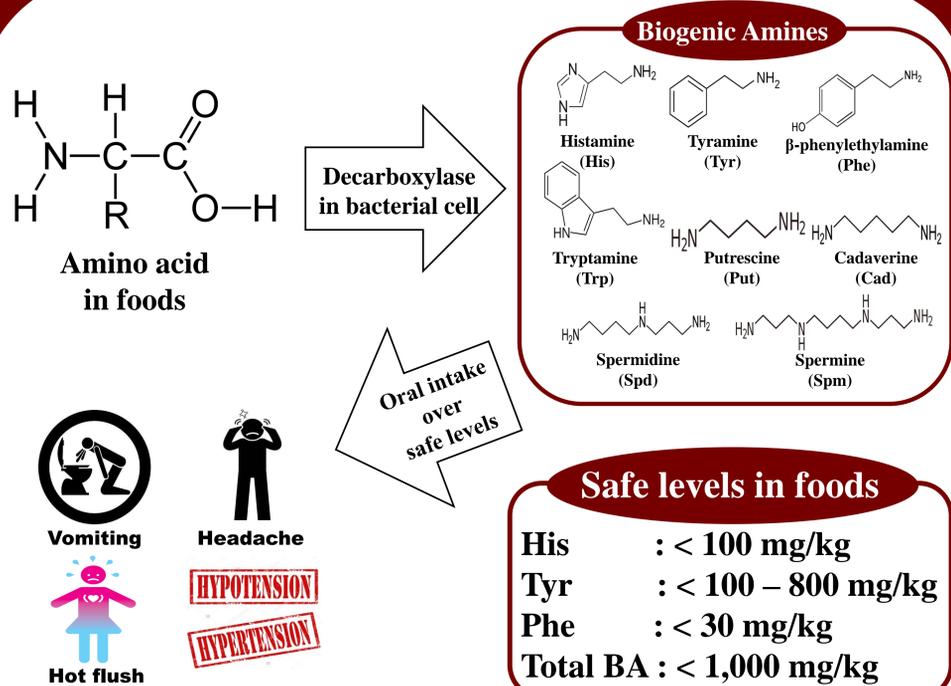
Determination of biogenic amine production by lactic acid bacteria in *Kkakdugi* (Korean radish kimchi)

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Abstract

Kimchi is a Korean traditional fermented vegetable listed on Food Codex Alimentarius in 2001. *Kkakdugi* (Korean radish kimchi) is almost as popular as *Baechu* (Chinese cabbage) kimchi in Korea and the source of beneficial lactic acid bacteria (LAB). Although health benefits of LAB in kimchi have been reported in numerous articles, there have also been several studies describing that some LAB result in high levels of biogenic amines (BA) in other fermented foods (e.g., sausage and cheese). Nonetheless, insufficient research has been conducted regarding the potential hazard of BA in *Kkakdugi*. In this study, BA content in various *Kkakdugi* samples was measured to estimate the BA-related risks. Most samples contained low BA content for consumption. However, histamine level over safety limit (100 mg/kg) was detected in one sample, in which putrescine level was also relatively high. Another sample showed the highest concentration of putrescine up to approximately 1,000 mg/kg and, consequently, had total BA content over the recommended safety level (1,000 mg/kg). Meanwhile, there appeared to be moderate positive relationship ($R^2 = 0.7$) between tyramine content and acidity (an indicator of kimchi ripening) of the samples. Taken together, most of *Kkakdugi* samples were considered safe for consumption, but the causes of perceived risk related to BA needed to be taken into account. To understand bacterial contribution to BA in *Kkakdugi*, BA production by LAB strains from respective samples was also determined. Most LAB strains produced BA at low levels although some strains isolated from over-ripened *Kkakdugi* samples had relatively high capacity to produce tyramine, which is in agreement with the relationship between tyramine content and acidity of samples. Further studies on BA production (especially histamine and tyramine) by LAB are necessary to reduce BA content in *Kkakdugi*.

Introduction



Results

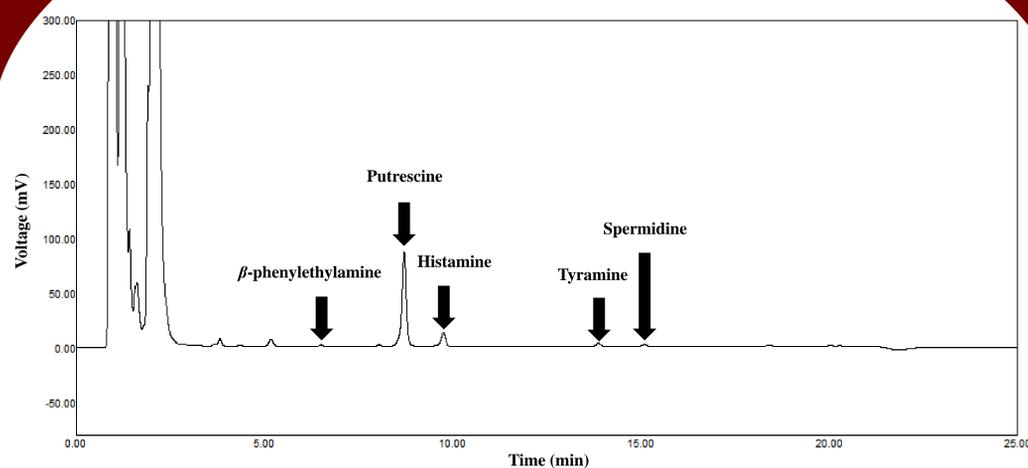
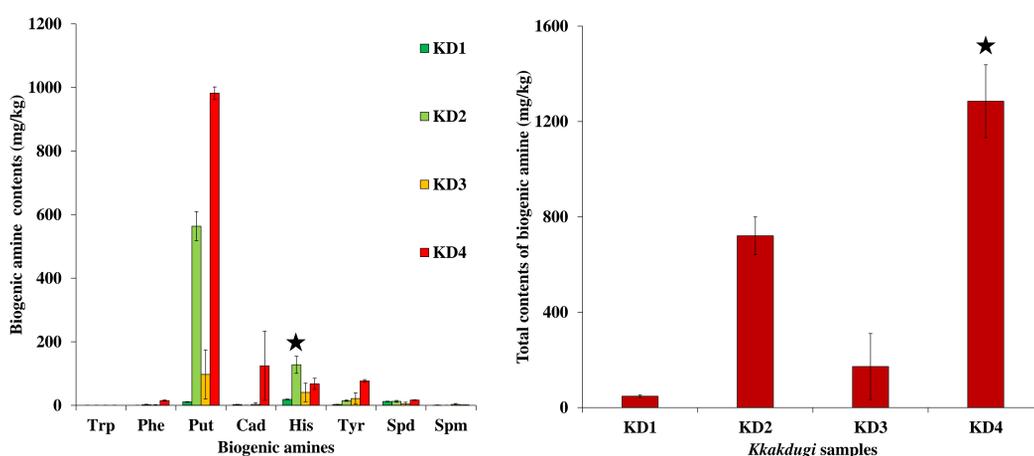
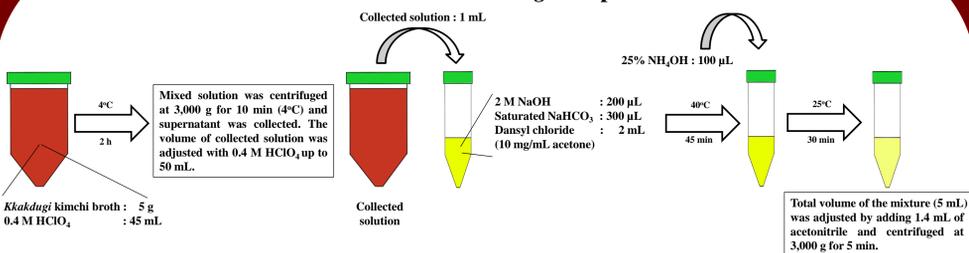


Fig. 1. Typical HPLC chromatogram of biogenic amines in *Kkakdugi*.

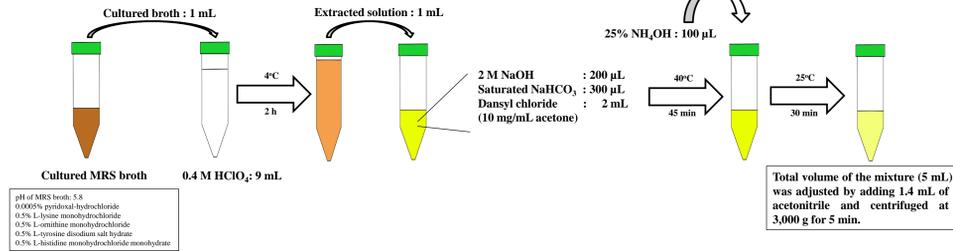


Materials & Methods

Extraction and derivatization of BA in *Kkakdugi* samples



Extraction and derivatization of BA in bacterial cultures



HPLC analysis of BA

After centrifugation, the supernatant was filtered through 0.2 μm-pore-size syringe filters for HPLC analysis.

Fig. 4. The liner fitting between tyramine content and acidity of *Kkakdugi* samples.

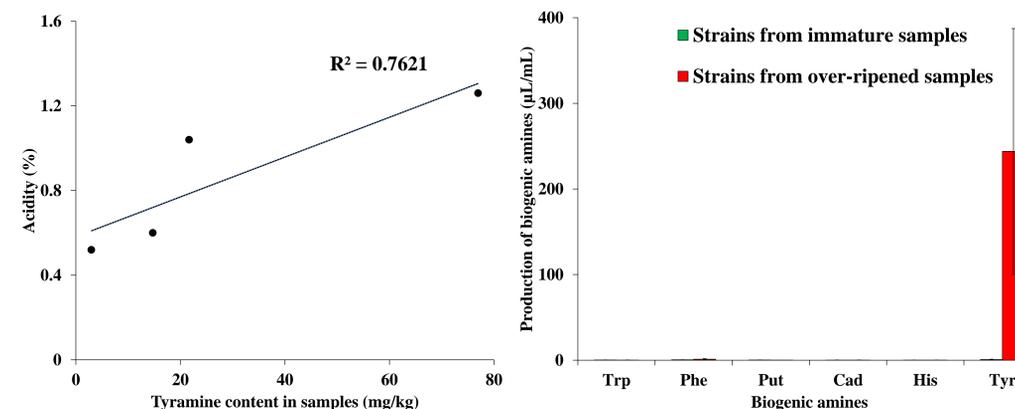


Fig. 5. Comparison of biogenic amine production by lactic acid bacterial strains isolated from immature and over-ripened *Kkakdugi* samples.

Conclusion

- Regarding BA contents in the samples, it is considered that most *Kkakdugi* samples are safe for consumption, but the causes of perceived risk related to BA needed to be taken into account.
- Tyramine content showed moderate correlations with the acidity in the samples.
- Most LAB strains produced BA at low levels although some strains isolated from over-ripened *Kkakdugi* samples had relatively high capacity to produce tyramine, which is in agreement with the relationship between tyramine content and acidity of samples.

References

- Mah J-H, Kim YJ, No H-K, Hwang H-J. 2004. Determination of biogenic amines in kimchi, Korean traditional fermented vegetable products. *Food Sci. Biotechnol.*, 13(6), 826-829.
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