

Influence of different lactic acid bacteria strains and milling process on the solid-state fermented green and red lentils (*Lens culinaris* L.) properties including gamma-aminobutyric acid formation

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The aim of this study was to evaluate the influence of lactic acid bacteria (LAB) strains (*Lactiplantibacillus plantarum* No.122 and *Lactocaseibacillus casei* No.210) and milling process on the solid-state fermented (for 24 h, at 30 °C) green and red lentils (*Lens culinaris* L.) properties, chiefly pH, LAB viable counts, colour coordinates, free amino acid (FAA) profile, γ -aminobutyric acid (GABA) and biogenic amine (BA) concentrations, fatty acid (FA) and volatile compound (VC) profiles. Results showed that both of the tested LAB strains are suitable for the fermentation of lentils: pH of fermented lentils was <4.5 and LAB viable counts >8.0 log₁₀ colony-forming units (CFU)/g. A very strong negative correlation was found ($r=-0.973$, $p<0.0001$) between LAB counts and pH of the samples. Also, fermentation and milling process were significant factors towards colour coordinates of the lentils. In most of the cases, solid-state fermentation (SSF) increased essential FAA content in lentils; however, some of the non-essential FAA content was reduced. SSF significantly increased GABA concentration in lentils and milling process was a significant factor on GABA content of the samples ($p \leq 0.05$). The main BA in lentils was spermidine, and SSF decreased their total BA content (34.8% on average in red lentils and 39.9% on average in green lentils). The main FA in lentils were linoleic and oleic. The main VC in lentils were hexanal, 1-hexanol, hexanoic acid, D-limonene, and (E)-2-nonen-1-ol. Furthermore, most of the VC showed significant correlations with pH of lentil samples, LAB counts and FA content. Finally, the LAB strain used for fermentation and the milling process of lentils are significant factors for most of the analysed parameters in lentil. Moreover, despite the higher GABA concentration found in green non-milled SSF lentils, application of combined milling and SSF is recommended because they showed the lowest BA content in addition to higher essential FAA and GABA concentrations.