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Cheese, wine and durian flavour components produced by carboligases

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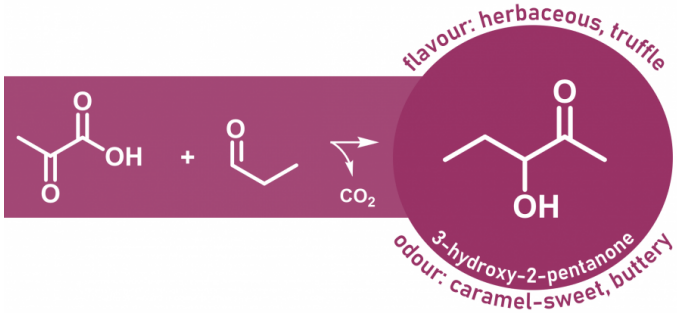
PURPOSE OF THE ABSTRACT

2-Hydroxy-3-pentanone (flavour: truffle,peanut; odour: buttery,hay-like) and its isomer, 3-hydroxy-2-pentanone (flavour: herbaceous,truffle; odour: caramel-sweet,buttery), are volatile acyloins that have been identified as flavour components of cheese, wine, durian, honey, butter, soy sauce, sherry and other foods [1]. Acyloins are typical products of the enzymatic acyloin-type condensation reaction catalysed by thiamine diphosphate (ThDP)-dependent carboligases. The reaction usually includes a decarboxylation of an α-keto acid and its subsequent ligation to an aldehyde, leading to acyloins [2]. By choosing complementary substrates the reaction can be directed towards one or the other isomer: pyruvate and propanal condense to 3-hydroxypentane-2-one (Figure 1), whereas 2-oxobutyric acid and acetaldehyde give the 2-hydroxypentan-3-one (Figure 2). Screening a panel of carboligases identified the pyruvate dehydrogenase from E. coli (EcPDH E1) as the most suitable, reaching product formation of up to 90%. Therefore, we decided to explore the sequence space by looking for uncharacterized analogues of EcPDH E1, in a search for higher activity and tolerance to high concentrations of substrates. To pre-screen the analogues, a colorimetric assay detecting the decarboxylation activity using DCPIP (2,6-dichloroindophenol) was used [3].

FIGURES



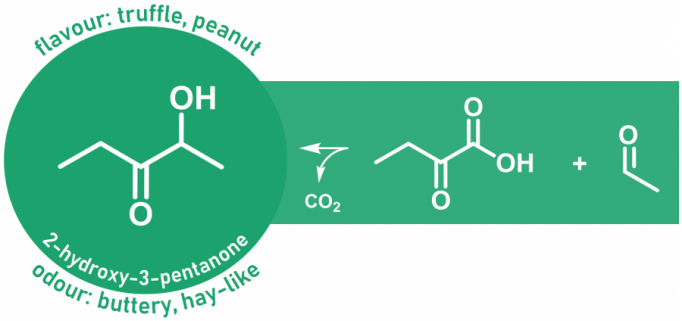


FIGURE 1
Carboligation reaction for preparation of 3-hydroxy-2-pentanone.

FIGURE 2
Carboligation reaction for preparation of 2-hydroxy-3-pentanone.

KEYWORDS
carboligase | flavour | acyloins | α-hydroxypentanone

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