BIOSYNTHESIS AND BIOMIMETIC SYNTHESIS OF HETEROCYCLIC β-SUBSTITUTED ALANINES IN HIGHER PLANTS

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Our recent works have shown that O-acetyl-L-serine(1) has an important role as a key intermediate in the biosyntheses of heterocyclic β-substituted alanines, such as β-(pyrazol-1-yl)-L-alanine(2) and similar compounds in higher plants.

This paper presents further such examples concerning enzymes in higher plants that catalyze the formation of (4)-(6) from (1) as shown in Chart 1. Enzymes for the formation of (2), L-mimosine(3) and L-quisqualic acid(4) have recently been purified to homogeneity from *Citrullus vulgaris*, *Leucaena leucocephala* and *Quisqualis indica*, respectively. These enzymes are specific for (1) as a donor for the alanyl-moiety, but show markedly differences in specificity for the heterocyclic substrate as acceptor and in molecular weight, optimal pH and Km value for (1). From above results, it can be concluded that they are different enzymes.

On the other hand, heterocyclic β-substituted alanines, such as (2)-(6) have biomimetically been synthesized by incubating a 0.1 M acetate buffer solution containing corresponding heterocyclic compounds and (1) or serine in the presence of pyridoxal 5'-phosphate (PLP) and metal ions. This PLP-catalyzed chemical reaction depends upon pH, metal ions and temperature. The addition of Ga^{3+}, Fe^{3+} or Al^{3+} enhanced the rate of synthesis.

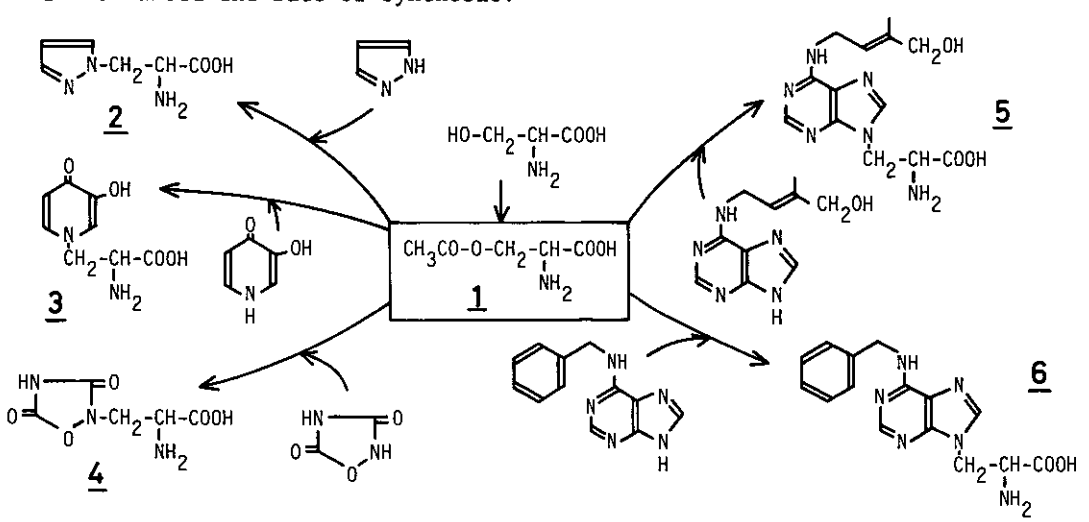

CHART 1