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The investigations reported in this thesis deal with the metabolism of arginine in relation to glutamic acid with special reference to enzyme arginase in normal and tumour tissues of plants cultivated in vitro. Arginine metabolism in a few other plant tumour tissues has been found to be peculiar, no arginase has been detected in these tissues and the arginine is shown to be metabolised by other pathways leading to various guanidino compounds.

In the studies reported in the present case, though normal and tumour tissues of Parthenocissus and tobacco seem to have very low arginase activity; both normal and tumour tissues of Rumex have high arginase activity. The tumour tissue has about twice the activity present in normal tissue. The enzymes linking ornithine to glutamate and proline metabolism such as ornithine transaminase and systems - glutamate to PCA and proline to PCA are high in tumour tissue. The enzyme arginase is found to be affected significantly by the presence of trace elements in the cultivation medium. The apparent low activity of arginase in Parthenocissus and tobacco tissues seems to be partially due to the inhibitory

metal ions present in these tissues and partially due to a heat-stable factor associated with the particulate fraction of the tissue homogenates.

The enzyme arginase has been partially purified and characterised from <u>Rumex acetosa</u> tumour tissue. The kinetics of the purified enzyme shows some differences from that reported for the arginase from other sources. The enzyme from Rumex tissue shows a pH optima of 10.5 and the nature and concentration of the buffer ions seems to play an important role on the enzyme activity. On the basis of the observation that buffer ions plays an important role and the sequence of addition of assay components affects the activity significantly, a tentative model for the enzyme-substrate complex through Mn is proposed. The Mn seems to bind the enzyme and substrate together and thus forming a link between the two. The binding of Mn at the active site takes place only when the active site is in a particular ionic state. The binding of the substrate with the enzyme seems to be in more than one site. The enzyme seems to be specific for L-arginine and the presence of free guanidino, $-NH_2$ and -COOH group is essential for activity.

In contrast to the enzyme reported from other sources the Rumex enzyme is not activated by Co and Ni but is inhibited by Co, Ni, Zn and Cu ions. The energy of activation is found to be 6.6 K calories/mole. Ornithine, lysine, agmatine, γ-guanidino butyric and guanidino acetic acid inhibit the enzyme competitively.

The most interesting observation reported in this thesis is the competitive inhibition of arginase activity by purines and pyrimidines. For the purines and pyrimidines to be inhibitory, a ring system with an ionic group on the 2nd position of the ring seems to be essential. The kinetics of the inhibition of these compounds is not a simple competitive one but seems to be of allosteric type. However, it has not been possible to show whether there is any difference between the competitive inhibition by purine and pyrimidines as compared to that by ornithine and lysine etc. This observation hitherto not reported in literature may be of significance in the regulation of urea formation which can also be obtained from purines and pyrimidines. Studies carried out by growing the Rumex tumour tissue in presence of purine and pyrimidine bases showed that in the presence of these inhibitors the arginase activity is decreased by 30-40% during the early period of growth but during the latter period this inhibition is removed. Addition of arginine to the medium does not seem to offer any protection towards this regulation.