

Abstract

The basic characteristics of thiamine metabolism in germinating seeds of maize (*Zea mays*), oat (*Avena sativa*), faba bean (*Vicia faba*) and garden pea (*Pisum sativum*) are presented with a special emphasis of a possible thiamine storage function of seed thiamine-binding proteins (TBPs). Seeds were germinated for 6 d in the dark. Thiamine-binding activity in seeds decreased during germination by 50% in cereals and by 30% in legumes. The degradation of TBPs was also detected by polyacrylamide gel electrophoresis. The total thiamine content decreased rapidly to 20–40% of the initial value in cereal seeds during first 3 d of germination while in legume seeds thiamine content started changing from the fourth day and dropped by 50% at the sixth day. A composite pattern was found for the changes in thiamine pyrophosphate (TPP) contribution to total thiamine during seed germination. A peak of the coenzyme percentage was usually detected at the second day of germination. Another gain of TPP was often seen toward the sixth day of germination. The activity of thiamine pyrophosphokinase (EC 2.7.6.2) was high in resting legume seeds and did not significantly change during germination. In contrast, the low activity of this thiamine-activating enzyme in cereal seeds progressively increased during germination. Thiamine phosphate synthase (EC 2.5.1.3) was also detected in seeds and was shown to contribute significantly to the balance of thiamine compounds during seed germination.

Abbreviate: HET-P, 4-methyl-5-(2-hydroxyethyl)thiazole phosphate; HMP-PP, 2-methyl-4-amino-5-hydroxymethylpyrimidine pyrophosphate; HPLC, high-performance liquid chromatography; NPP, p-nitrophenylphosphate; SDS-PAGE, polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate; TBP, thiamine-binding protein; TMP, thiamine monophosphate; TMPS, thiamine phosphate synthase; TPK, thiamine pyrophosphokinase; TPP, thiamine pyrophosphate