CHILLING STRESS EFFECTS ON THE GROWTH, MITOCHONDRIAL ACTIVITY AND PROTEIN SYNTHESIS IN ETIOLATED MUNGBEAN SEEDLINGS

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Abstract: Mungbean (*Vigna radiata* L.), a chilling sensitive plant species, was used in this study. Seeds were germinated at 28°C in the dark for 32 h before cold treatment. The seedlings were chilled at 4°C for various durations. Growth, respiration rate, protein synthetic activity, cellular leakages and succinate dehydrogenase activity in isolated mitochondria were then determined.

Chilling at 4°C suppressed seedling growth, increased solute leakages, suppressed succinate dehydrogenase activity in isolated mitochondria, inhibited general protein synthesis and induced the synthesis of a set of proteins termed chilling-induced proteins. The molecular weights of these chilling-induced proteins were 110, 88, 78, 69, 58, 48, 38, 27, 22, 19, 14, 12.5 and 10.5 Kd, respectively and the proteins with molecular weights of 88, 69, 58, 48, 38, 14, 12.5 and 10.5 Kd were the major chilling-induced proteins of mungbean seedlings. These chilling-induced proteins were different from the heat shock proteins of mungbean seedlings.

INTRODUCTION

Temperature is one of the major environmental stress governing the growth, development and distribution of both wild and cultivated plants.

Tropical and subtropical plants exhibit a marked physiological dysfunction when they are exposed to low or nonfreezing tempertures below 10°C to 12°C. This dysfunction is referred to as chilling injury and has been studied of great concern for many years with harvested plant parts. Because lowered storage temperature is generally one of the effective means of extending the postharvest life of fruits and vegetables (Couey, 1982).

Various physiological and biochemical alterations occur in response to chilling stress in plants (Wang, 1982). The extent of these alterations and the ability of the plant to withstand these alterations determine whether the plant is sensitive or resistant to chilling at that temperature. Chilling-sensitive plants are those killed or seriously injured by temperatures above the freezing point of the tissue, up to about 15-20°C in some case. The severity of damage usually increases at lower temperatures and is time-temperature dependent (Lyons, *et al.*, 1979). All plants able to grow near 0°C are classified as chilling-resistant.

The physiological and biochemical responses of plants to chilling stress have been widely documented and reviewed recently (Graham & Patterson, 1982). These

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