CHAPTER 1

INTRODUCTION

Boron (B) deficiency is the most widespread of all micronutrient deficiencies. In the field, B deficiency has been reported in over 80 countries and at least 132 crops (Shorrocks, 1997), leading to reduced crop productivity and farm income. There is a potential for widespread boron deficiency in *Helianthus annuus* L. (sunflower), *Arachis hypogaea* L. (peanut), *Phaseolus mungo* L. (mung bean) as well as *Triticum aestivum* L. (wheat) and *Hordeum vulgare* L. (barley) in Northern and Northeastern Thailand (Rerkasem, 1986; Rerkasem *et al.*, 1988 and Rerkasem *et al.*, 1989). In wheat, deficiency of boron can cause yield reduction through impaired development of the anther and pollen grain and seed set failure, so this thesis emphasis on B in reproductive stage. There are numerous reports of this problem in wheat in Asia, including China (Li *et al.*, 1978), India (Tandon and Naqvi, 1992) and Thailand (Rerkasem and Jamjod, 1989). The introduction of B efficient cultivars onto these problem soils is one option in helping to maintain a high yield potential on low B soils (Rerkasem and Jamjod, 1997).

Boron efficiency is defined as the ability of plant genotypes to grow without any adverse effect in soil or other rooting media with a low level of B that is limiting to other genotypes (Rerkasem and Jamjod, 1997b). Significant cultivar variation in boron efficiency has been demonstrated amongst wheat cultivars on numerous

occasions in field and glasshouse conditions (Rerkasem and Jamjod, 1997). These authors have also identified five levels of B efficiency in wheat, namely very inefficient (VI), inefficient (I), moderately inefficient (MI), moderately efficient (ME), and efficient (E).

From the literature, it is suggested that a genotype may be B efficient or inefficient due to two general mechanisms: the ability to acquire B from the soil; the way that B is distributed and utilised within the plant. In a given species, the mechanism for B efficiency may differ with the genotypes being compared and with the intensity of deficiency (Rerkasem and Jamjod, 1997b; Yang and Romheld, 1999). It has been postulated that the array of B efficiency classes previously reported represents either up to five different mechanisms for B efficiency in the wheat germplasm and/or different levels of attenuation for individual mechanisms (Rerkasem and Jamjod, 1997a).

Identifying the key efficiency mechanisms may provide the basis for identification of genes and markers for future breeding and selection for B efficient genotypes. Such information will be useful for improving wheat production on low B soils.