A wide range of variation was found in the properties tested among *Amaranthus* species and among genotypes within the same species. It was generally found that the amylose content of cultivated genotypes of *Amaranthus* was lower than that of non-cultivated genotypes; starch of cultivated genotypes had more stable pasting properties (i.e. higher peak viscosity, lower viscosity drop during shear thinning and lower retrogradation) than noncultivated genotypes; starch of cultivated genotypes had lower $T_p$ and higher $\Delta H$ than non-cultivated genotypes; the starch pastes of cultivated genotypes were stable during cold storage, i.e. hardness, cohesiveness and modulus of cultivated starch pastes were lower, and adhesiveness was higher, compared to non-cultivated genotypes. The values for pasting, functional, and thermal properties of *Amaranthus* starch were highly correlated, especially the pasting and functional properties. Amylose content was closely related to the physical and functional properties of *Amaranthus* starch. The environmental effect on the properties of *Amaranthus* starch was different for different species. Compared to the reference corn, rice, potato and wheat starches, *Amaranthus* starch tended to have more stable paste, i.e. lower shear thinning and lower retrogradation, and higher $T_p$ and $\Delta H$; *Amaranthus* starch paste was more resistant to cold storage. Generally, many *Amaranthus* starches would be good thickeners and stabilizers in food processing. The wide genetic diversity necessitates specific choices for specific uses.

1. INTRODUCTION

Grain amaranth, an annual food and feed crop, is a dicotyledonous $C_4$ plant belonging to the *Amaranthaceae*, genus *Amaranthus*, and consisting of several species. It is a
2. CHARACTERISTICS OF GRAIN AMARANTH IN CHINA

There are two types of amaranth, vegetable amaranth and grain amaranth. On top of the stem is an indefinite inflorescence, the panicle. Amaranth grain is very small (about half the size of millet), and may be light yellow, brown-yellow or brown-black in color. The 1000 seed weight is 0.6 – 0.9 g, and 60,000 – 100,000 seeds can be produced by a single plant. Grain amaranth has four notable characteristics:

- High grain protein content (around 16%) and quality (high lysine content); leaf protein comparable to alfalfa (lucerne).
- High yield potential. It typically gives a grain yield of 2,250 – 4,500 kg ha⁻¹ and a fresh weight of leaf and stem of 30,000 – 60,000 kg ha⁻¹.
- High stress tolerance, to drought, salinity, alkalinity, or acidic soil conditions.
- Very low seeding rate and high germination rate, making it suitable for reclamation of barren land using aerial sowing.

Chapter 11 presents more detail on the composition and nutritional quality of Amaranth species.

3. INTRODUCTION OF GRAIN AMARANTH TO CHINA FROM ABROAD

Since 1982 we (Professors SX Yue and HL Sun) have introduced many varieties of grain amaranth from the United States and planted them in more than twenty regions in China with good results (Yue et al., 1993). Through 13 years of screening and breeding, five varieties have been approved by the Government and released throughout the country. These varieties are *Amaranthus cruentus* R104, *A. cruentus* K112, *A. hypochondriacus* 1023, *A. hypochondriacus* 1024, and *A. hybridus* 1004. The area planted to commercial amaranth (grain and forage) annually in China has now reached 86,000 ha, mainly distributed in Sichuan and Yunnan Provinces and areas of north and northeast China, and in coastal shoally land, etc.

4. THE PRESENT STATUS OF AMARANTH RESEARCH AND DEVELOPMENT IN CHINA

4.1. Amaranth as a Feed Source

Using amaranth grain meal or dry leaf meal in compound feed for chicken, pig, and cattle can raise the quality and yield of the animal products. For raising fish in coastal