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Grain amaranth, *Amaranthus hypochondriacus* L. is one of less exploited tropical crops of considerable value for the future. Historically it was cultivated as a staple food crop in Mexico, Central America and South America prior to the 16th Century. Grain amaranth is still a major crop over large regions (Sauer, 1977). Amaranth grain is of great nutritive importance for its high protein content and quality. Amaranth seed is known to be rich in lysine and sulphur containing amino acids which are otherwise deficient in the protein of wheat, corn and rice (Senfit, 1979).

*Amaranthus hypochondriacus* L. (grain amaranth) is a rapidly growing potherb with high capacity for edible dry matter production per unit area over a relatively short period of time. Grain amaranth produces higher seed yields than barley, wheat and triticales and its grain yield compares well with average yields of other agronomic crops. Scientific interest in grain amaranth has recently been stimulated by its high photosynthetic and assimilation rates associated with C₄ photosynthesis. It has, however, been observed here that the grain amaranth shows the C₃ tendency in respect of its water relations exhibiting relatively lower growth rates and yield during the Summer season. This unique behaviour
has prompted the present work resulting in a detailed study of the water relations of the grain amaranth, a C4 aspartate type.

Field experiments were carried out at the University of Hyderabad during two seasons in 1979. Later the experiments were carried out in a semiglass house chamber due to problems involved in the maintenance of desired levels of water stress. Glass-house was covered with fully transparent 4 mm glass to prevent rain water while allowing the sunlight to pass through. The sides of the glass-house were covered with wire mesh to protect the plants from the attack of rodents. The plants were raised in plastic pots of 30 cm diameter holding 500 gms sand at the bottom and 7.5 kg soil with Farmyard manure (3 parts of red soil + 1 part of farmyard manure) under natural photoperiod. The field capacity of the soil was determined prior to use. 10 to 15 healthy seeds were sown in each pot and 3 plants per pot were allowed to grow after germination. The soil water levels of field capacity (control) and the stress levels at 50% field capacity and 25% field capacity were maintained by adding known volume of water at different growth stages: vegetative, flowering, grainfilling and senescent. The experiments were
conducted in two seasons Winter season (Day temperature ranging from 22° - 32°C) and Summer season (Day temperature ranging from 32° - 43°C) to find out the interaction of seasonal variation in relation to variable water regimes.

Special emphasis was made to find out the physiological and biochemical responses of grain amaranth, *Amaranthus hypochondriacus* to variable water regimes imposed at different growth stages. The responses were ultimately evaluated in relation to agronomic production of crop.