ABSTRACT

STUDIES ON AGRONOMIC AND PHYSIOLOGICAL DETERMINANTS OF YIELD IN VEGETABLE AMARANTH

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A study on agronomic and physiological determinants of yield in vegetable amaranth was conducted in Trinidad West Indies, using two amaranth (*Amaranthus dubius*) cultivars, UW-Joyce and Jamaica Native. The study involved a series of field and greenhouse trials which investigated the effects of plant density, clipping height, moisture stress, light intensity, reciprocal grafting and plant growth regulators, on growth development and yield of vegetable amaranth.

Vegetable amaranth has the potential for producing relatively high yield. However, significant differences, were noted among cultivars, for yield and harvest duration (the period between the first clipping and the final clipping). UW-Joyce produced the highest yield, with fresh yield of 334 t/ha over a harvest duration of nine months, whereas yield from other cultivars ranged from 20 to 100 t/ha over a harvest duration of one to four months. Yield from UW-Joyce represents a six-fold increase over the maximum yield previously reported for a single crop.

It appears that shoots were produced in rhythmic cycles, with Jamaica Native having one cycle while UW-Joyce seems to have four cycles. Plant density had no effect on harvest duration but its effect on yield varied with cultivar. Total fresh weight yield of UW-Joyce was not influenced by density treatment whereas for Jamaica Native, plants at high density outyielded those at lower densities. The effect of clipping height on yield and harvest duration also varied with cultivar. Clipping height had no effect on the harvest duration and yield of Jamaica Native, but for UW-Joyce, plants clipped at 40cm had a longer harvest duration and produced higher yield than those clipped at 80cm.

Moisture stress reduced vegetative growth, resulting in lower leaf area, shoot elongation and dry matter accumulation. A reduction in transpiration rate, stomatal conductance and photosynthetic rates were also noted with decreasing soil moisture. Previous exposure to moisture stress, however, had no adverse effect on subsequent shoot growth and development.

Reduced sunlight resulted in lower leaf area, dry matter accumulation and a delay in the time to flowering. The reduction in dry matter accumulation with reduced light was due to lower photosynthetic rate. Under reduced sunlight, marketable shoot characteristics were enhanced, with increased shoot length, succulence, and leaf to stem ratio (leafiness).

Reciprocal grafts of UW-Joyce and Jamaica Native showed that the root system had no influence on shoot growth and flowering characteristics. Differences in shoot growth and flowering characteristics seem to be determined by the growth potential of the shoot apex. Further studies with five PGRs seem to suggest that reduction in growth potential of the shoot apex was probably due to a lack of GA_3.