## The growth and development of pearl millet as affected by photoperiod

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<u>Pennisetum americanum</u> is grown in a wide range of latitudes, particularly in India and Africa. It is a facultative short day plant (I). The growth of the cultivar, BJ104, was examined at ICRISAT, Hyderabad, India over a range of densities for its response to changes in development initiated by photoperiod.

## Methods

Artificial lighting (minimum light intensity 0.224 Wm<sup>-2</sup>) was used to extend the normal daylength of 13.5 hrs at the beginning of the monsoon season to 14.5 and 15.5 hrs from 5 days after emergence until beyond panicle initiation in each case. Within each daylength, 20 densities, ranging from 50,000 to 400,000 plants ha<sup>-1</sup>, were planted in Nelder fan designs.

## **Results and Discussion**

Increased daylength lengthened the time to panicle initiation from 16 days after emergence in the 13.5 hr daylength to 23 and 34 days in the 14.5 and 15.5 hr daylengths respectively. Longer daylengths applied during vegetative growth had no effect on the duration of panicle development, but resulted in a slight decline in the duration of grain filling, due to a reduced number of productive tillers per plant. However the total production of tillers per plant was similar in all daylengths. This restriction in tiller development was due either to increased apical dominance of the main axis or to increased shading within the plants of lengthened vegetative growth. Extended daylengths resulted in greatly increased vegetative dry weights at 50% anthesis and physiological maturity: plant height increased from I.5 to 2.4 and 2.6 m as daylength increased from 13.5 hr to 14.5 hr to 15.5 hr respectively. Early in plant growth, the rate of development of green leaf area per plant was the same (148?5.9cm<sup>2</sup>plant 'day<sup>1</sup>) for the three daylengths, yet the rate of leaf appearance decreased from 0.477:<sup>4</sup>:0.009 leaves day<sup>1</sup> in the normal daylength to 0.412?0.024 and 0.429 0.015 leaves day<sup>1</sup> in the 14.5 and 15.5 hr daylengths. This result implied an increase in leaf size with extended daylength, similar to that found by Ong and Everard (2), although they found no decline in leaf appearance rate. Extended daylengths resulted in increased leaf areas per plant and increased final leaf numbers e.g. 17.4, 21.1 and 22.8 leaves on the main axis in the 13.5, 14.5 and 15.5 hr daylengths respectively. However, these maximums and the subsequent senescence of leaves occurred earlier in the development of the plant in the extended daylengths. Grain yield in the normal daylength increased with density to 4,400 kg ha<sup>-1</sup> at 150,000 plants ha<sup>-1</sup> and remained constant at higher densities. The grain yields in the extended daylengths were greatly reduced at lower populations due chiefly to reduced head numbers per plant. However at higher populations the yields in the extended daylengths were similar to those in the normal daylength. Harvest index of the plants in the normal daylength decreased from 0.39 as population

increased above 62,000 plants ha<sup>-1</sup>. Harvest indices for the 14.5 and 15.5 hr daylengths did not correlate with population and the means were 0.24 and 0.22 respectively. Therefore, lengthened photoperiod resulted in larger vegetative plant dry weights but not necessarily larger grain yields per plant.

1. Begg, J.E. and Burton, G.W. 1971. Crop Sci. 11, 803-805.

2. Ong, C.K. and Everard, A. 1979. Expl. Agric. 15, 401-410.