EFFECTS OF CHILLING TEMPERATURES ON PHOTOSYNTHETIC RATE IN AUSTRALIAN PEANUT VARIETIES

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Recent research has demonstrated the extreme sensitivity of many commercially important peanut cultivars to low temperatures at night (viz. < 20^0C), with that sensitivity expressed as reduced photosynthetic rates the following day. However, significant variation in cool temperature response exists amongst currently available peanut germplasm in Canada (1). The objectives of this study were to evaluate the range of chilling sensitivities that exist within advanced breeding lines and introductions within the Australian breeding program, and to determine the correlation between chilling sensitivity and yield in a cool, subtropical environment in south-eastern Queensland.

MATERIALS AND METHODS

Twelve Virginia genotypes were grown in an irrigated trial at Kingaroy in 1993/94. Cultivars were selected on the basis of yield performance at a number of locations throughout Queensland. On 11 occasions during the early stages of podfilling, during which minimum air temperatures the preceding morning varied between 5.5 and 19.5^0C, leaflet carbon dioxide exchange rates (CER) were measured using a Li-Cor 6200 portable photosynthesis system. The variation between canopy minimum temperature, determined using an infra-red thermometer, and minimum air temperature was determined for a range of weather conditions. At maturity, all genotypes were harvested for assessment of total dry matter production and yield.

RESULTS AND DISCUSSION

During warm night (19-20^0C) conditions, all varieties exhibited leaflet CER >30umol/ m^2/s. All responded to falling night temperature by reducing CER the following day, although the extent of that reduction varied with genotype (Fig. 1). This variation was not significant until minima dropped below 16^0C, and was due to a reduction in maximum CER under high photosynthetic photon flux densities.

Seasonal conditions were such that >40% of days experienced screen minima < 16^0C. The predominantly dry weather conditions also favoured radiative cooling at night, such that canopy temperatures were often up to 4^0C cooler than air minima. However, there was no clear association between

relative sensitivity to low night temperature and pod yields, which ranged from 3740 - 6760 kg/ha.

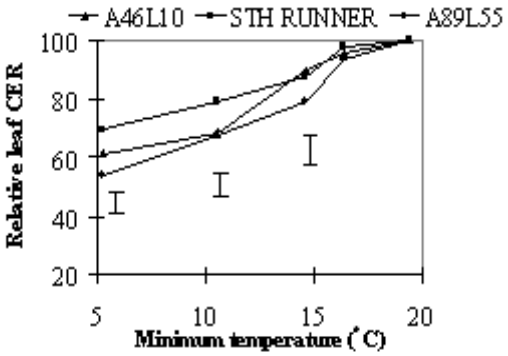

Figure 1. Effects of minimum temperature on relative CER for a subset of varieties.

REFERENCES

1. Bell, M., Gillespie, T., Roy, R., Michaels, T. and Tollenaar, M. 1994. Crop Sci. 34, 1023-1029.