Temperature response comparison of controlled and field environments for four tropical grasses

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Introduction Tropical grasses are cultivated mostly as annuals in the warm region of SW Japan. They have a long-term sowing time after harvesting temperate Italian ryegrass. We compared the early growth of tropical grasses in a controlled environment vs. field data at 2 sowing times to determine their temperate response.

Materials and methods From 19 December, 2001 to 28 January, 2002, a controlled environment facility (CEF) experiment was conducted at the National Agricultural Research Center, Kyushu Okinawa Region (32º 53' N, 130º 44' E). Rhodesgrass (*Chloris gayana* Kunth cv. Asatsuyu: Rg), guineagrass (*Panicum maximum* Jacq. cv. Natsukomaki: Gg), colored guineagrass (*Panicum coloratum* L. cv. Tamidori: Cg), and sudangrass (*Sorghum sudanense* (Piper) Stapf cv. Sugarslim: Sg) were sown with 3 seedlings per 1/5000 a Wagner pot. Temperature regimes were 20/15°C (LT), 25/20°C (MT), and 30/25°C (HT). Day length and relative humidity were 14h and 80%, respectively. The plants were sampled 40 days after sowing to investigate the tiller number, top dry matter weight (TDW), mean tiller weight (MTW) and growth rate (GR). From 14 May to 18 July, 2002 a field data (FD) experiment was conducted on an experimental field in the Nagasaki Livestock Experimental Station (32º 14' N, 130º 20' E). Sowing dates of the same 4 species were 14 May (MS) and 7 June (JS). Sowing rates of Sg and the other 3 grasses were 3 and 1g/m^2, respectively, at a 40-cm row distance. Plants were sampled 44–46 days after sowing to investigate growth characteristics and to calculate the crop growth rate (CGR).

Results Daily mean temperature increased with the increase in temperature regime in the CEF and was higher at JS in FD. As regards daily mean temperature, MS was plotted between LT and MT; JS was between MT and HT. Figure 1 shows TDW and MTW. TDW and MTW increased concomitant with the increase in daily mean temperature in both FD and CEF. The changes in MTW correlated almost exactly with those in TDW. Figure 2 shows relations of daily mean temperature with GR and CGR. Differences of GR in CEF among grasses were greater than those of CGR in FD. The GRs of Gg and Sg increased constantly from LT to HT, whereas those of Rg and Cg increased slowly from MT to HT. The high GRs of Sg and Rg at LT in CEF were related to high seed weight (Fukagawa *et al.*, 2003) and a high germination rate.

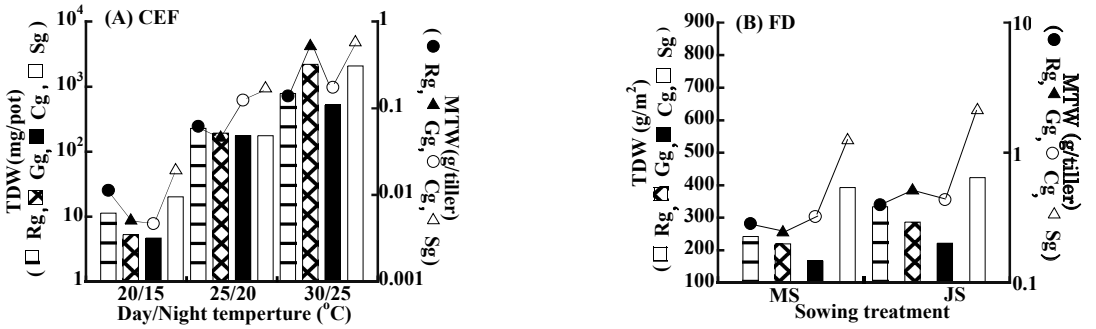

Figure 1 Effect of temperature on TDW and MTW

Conclusions Air temperature affected early growth for grasses sown from May to July in FD analogously to that in CEF. For that reason, optimal grass species for May-sowing would be Sg and Rg. Optimal species for late sowing in July would be Sg and Gg because of their prominent early growth.

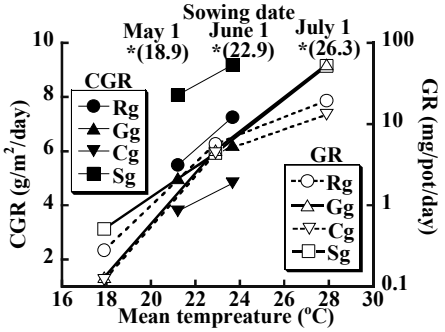

Figure 2 Relations of mean temperature with GR and CGR

References

Fukagawa S., K. Sato, R. Kobayashi & I. Hattori (2003). Effect of temperature treatment on the germination and early growth in five tropical grasses. *Kyushu Agricultural Research*, 65, 132.