Journal of Tropical Agriculture 46 (1-2): 62–63, 2008

Short communication

Evaluation of some sorghum [*Sorghum bicolor* (L.) Moench] cultivars and lines as sweet, dual purpose, and grain types

A. Almodares*, R. Taheri, and S. Adeli

Biology Department, College of Science, University of Isfahan, Isfahan, 81846-73441 Iran.

Received 26 September 2007; received in revised form 25 May 2008; accepted 2 June 2008.

Abstract

Nine cultivars and lines of sorghum of Iran were evaluated for sucrose content, grain yield, and yield components. Results show that cv Rio had the highest sucrose content (125.6 g kg^{-1} fresh stalk) and cv Turno, the lowest (28.8 g kg^{-1}). IS 18154 (1085 g m^{-2}) had the highest grain yield and cv Rio (541 g m^{-2}), the lowest. Soave was intermediate in both sucrose content and yield; hence can be recommended either as grain or sweet sorghum type. Cv Turno, with low sucrose content, and yield is neither suitable as a sweet nor grain cultivar. Other sweet sorghum cultivars or lines that were evaluated in this study may be used for dual purposes.

Keywords: Iran, sucrose content.

Sweet sorghum (*Sorghum bicolor* (L.) Moench) is well adapted to the sub-tropical regions of Iran (Rego et al., 2003). Although many sorghum cultivars are grown in Iran, there are no reports categorizing them into different types to help the farmers select the most suitable sweet, grain, or dual purpose lines. The objective of this study was to categorize nine popular sweet sorghum cultivars and lines of Iran by comparing their vegetative and reproductive growth characters.

Five sweet sorghum cultivars (Soave, Rio, Vespa, Turno, and M81-E) and four sweet sorghum lines (IS 6962, IS 18154, IS 4546, and IS 16054) were evaluated in a randomized complete block design with four replications at the Isfahan University Research Station (31º31' N, 5º51' E, altitude 1550 m above sea level), Isfahan, Iran in 2003 and 2004. Mean maximum and minimum air temperatures at planting (June) were 32.9ºC and 14.4ºC and at physiological maturity (Oct.) 19.7ºC and 1ºC respectively. Plots consisted of eight rows, 5 m long and 0.8 m apart and received fertilizers at the rate of 300 kg ha^{-1} of diammonium phosphate and 100 kg ha^{-1} of urea before planting and another 100 kg ha^{-1} urea 30 days after planting. To determine grain yield and its components (number of panicles/m^2, number of grain in a panicle, and 100 grain weight), plants were harvested from an area of 1.5 m^2 and oven-dried at 70ºC for 72 h. The sucrose content of fresh stalk at physiological maturity was determined as per Varma (1988). Forward stepwise regression was used to evaluate which components contributed more to yield.

A comparison of the data in Fig.1 shows that Rio had the highest (125.6 g kg^{-1}) and Turno the lowest (28.8 g kg^{-1}) sucrose content at physiological maturity (on fresh stalk yield basis). IS 18154 had the highest grain yield (1085 g m^{-2}; Table 1) among all the cultivars and lines and the lowest was for Rio (541 g m^{-2}). Turno, Vespa, and Soave had the highest number of panicles, number of grains in a panicle, and 100 grain weight, respectively.

The interrelationships between grain yield and its components in sorghum can be expressed as: Yield = –1442.05 + 35.3 E m^{-2} (number of ear m^{-2}) + 0.443 G/E

*Author for correspondence: Telephone +983112369005; Email <aalmodares@yahoo.com> or <almodares@sci.ui.ac.ir>.

(number of grain/ear) + 327.3 W/G (hundred grain weight). The high R^2 values (0.97; Table 2) indicates a good fit and that the number of ears m^{-2} is the most important determinant of grain yield, accounting for 59% of total variability. Sucrose content and yield are indicators of how the assimilates are partitioned among different sinks (Crosbie and Mock, 1981). The amount of assimilates allocated for sucrose biosynthesis in the stem and grains depends on the type of sweet sorghum cultivars and lines. Apparently, cv Rio had the high photosynthetic capacity and much of the photosynthates were probably not mobilized into the grains (Dolciotti et al., 1998); consequently its sucrose content was the highest among sweet sorghum cultivars and lines, making it the most suitable sweet sorghum cultivar. Soave, IS18154, and M81-E were intermediate in this respect and can be considered either as sweet or grain sorghum type. Vespa with its high LAI and biological yield (data not presented) may be used for forage purposes. Turno had the lowest sucrose content and grain yield, hence this cultivar is unsuitable for sweet sorghum or grain production.

Table 1. Performance of nine cultivars and lines of sweet sorghum in the sub-tropical region of Iran.

Cultivar/ Lines	Grain yield ($g\ m^{-2}$)	No. of panicles	No. of grain in a panicle	100 grain weight (g)
Cultivar				
Soave	957^{b}	20.3^{de}	1698^{b}	2.8^{a}
Rio	541^{f}	19.9^{de}	1360^{f}	2.0^{de}
Vespa	645^{d}	15.2^{f}	1768^{a}	2.4^{bc}
Turno	758^{c}	40.4^{a}	1340^{f}	1.4^{f}
M81-E	973^{b}	24.3^{cd}	1602^{c}	2.5^{ab}
Lines				
IS 6962	546^{f}	21.8^{de}	1567^{d}	1.6^{ef}
IS 18154	1085^{a}	33.3^{b}	1482^{e}	2.2^{cd}
IS 4546	609^{e}	19.1^{ef}	1569^{cd}	2.0^{de}
IS 16054	764^{c}	26.6^{c}	1368^{f}	2.1^{de}

Means comparisons were made using Duncan's Multiple Range Test. Means with the same letter in a column are not significant at 5% level.

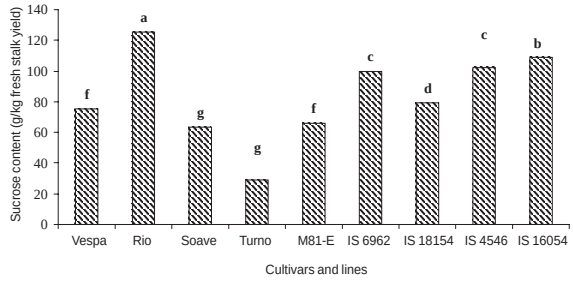

Figure 1. The sucrose content of nine cultivars and lines of sweet sorghum grown in the subtropical region of Iran at the stage of physiological maturity (mean comparison by Duncan's multiple range test; bars with the same letter are not significant at 5% level).

Table 2. Share of yield components to grain yield of nine cultivars and lines of sweet sorghum in the sub-tropical region of Iran.

Yield components	R^2
E/m^2	0.59
$E/m^2 \cdot G/E$	0.93
$E/m^2 \cdot G/E \cdot W/G$	0.97

E/m^2: Number of ear/m^2; G/E: Number of grain/Ear; W/G: 100 grain weight.

References

Crosbie, T. M., and Mock, J. J. 1981. Changes in physiological traits associated with grain yield improvement in three maize breeding programs. Crop Sci., 21: 255-259.

Dolciotti, I., Mambell, S., Grandi, S., and Ventur, G.. 1998. Comparison of two sorghum genotypes for sugar and fiber production. Ind. Crop. Prod., 7: 265-272.

Rego, T.J., Nagesvara Rao, V., Seeling, B., Pardhasaradhi, G., and Kumar Rao, D.K. 2003. Nutrient balances a guide to improving sorghum and ground based dry land cropping systems in semi-arid tropical India. Field Crops Res., 81: 53-68.

Varma, N.C. 1988. System of technical control for cane sugar factories in India. The Sugar Technologist's Association, India.