

Coating seeds with hydro-absorber as a possible mitigation strategy for unreliable rainfall patterns for early-sown sorghum

Gorim L., Asch F.

University of Hohenheim, Institute for Plant Production and Agroecology in the Tropics and Subtropics, Section Crop Water Stress Management, Garbenstr. 13, 70599 Stuttgart, Germany. fa@uni-hohenheim.de

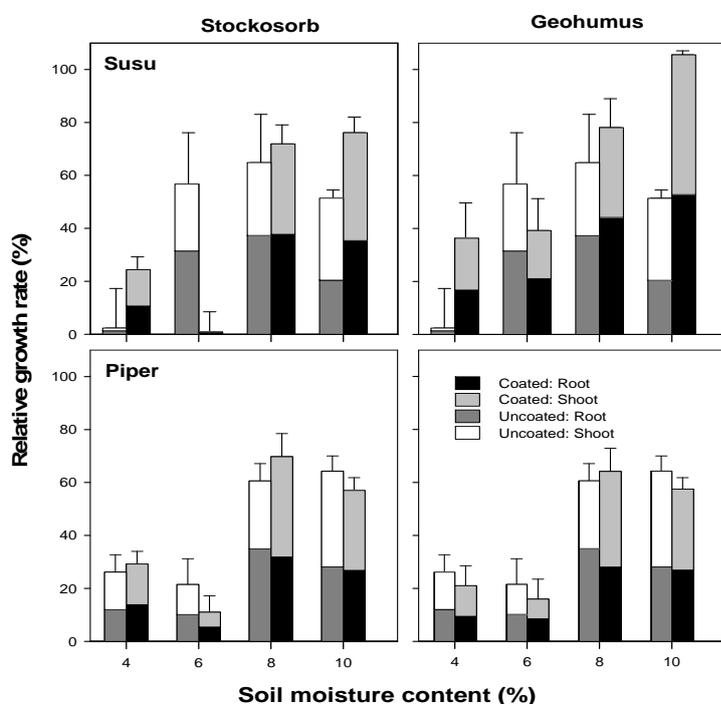
Rainfed agriculture increasingly suffers from the effects of climate change due to varied and unpredictable drought spells and delayed rainy seasons affecting in particular germination and seedling establishment in sorghum leading to substantial losses (Rosenzweig and Hillel, 1998; Kouressy *et al.* 2008). Coating seeds with water conserving hydro-absorbers may be an option to maintain germination and seedling growth during early drought spells (Berdahl and Barker, 1980). Two varieties of sorghum (*Sorghum bicolor* L. cvs. Piper and Susu) coated with two hydro-absorbers (Stockosorb® and Geohumus®) were studied to determine the coating effects on (1) early seedlings vigor (2) seedling establishment and survival under drought.

Materials and Methods

A dynamic drought experiment was conducted under semi-controlled greenhouse conditions with an ambient temperature of 20-25°C and 35-50% relative humidity. Seven plants were grown in each pot (1452cm²) in sand and pots were replicated 5 times. Five days after sowing, pots were allowed to dry; root and shoot dry matter was recorded every 2 days by destructive sampling from 5 pots, root length measured with a ruler; the number of plants that wilted was scored and the daily survival rate calculated.

Results and discussions

Figure 1 Effect of hydro-absorbers on the relative growth rate of root and shoot in two sorghum varieties (Susu and Piper) under different drought intensities. Bars represent standard error.



Relative growth rates of coated seeds under severe drought stress were significantly ($p < 0.05$) increased for both absorbers in Susu, but were not significantly affected in Piper. Geohumus promoted growth significantly better than Stockosorb in Susu at all soil moisture contents. Susu seeds coated and uncoated exhibited higher growth rates compared to those of Piper coated and uncoated seeds. Geohumus promoted growth significantly in Susu compared to piper and this was also true for Stockosorb. Under progressive drought stress, sorghum root biomass and length increase (Abdulai *et al.* 2004). This effect was enhanced by both coatings promoting root growth as the drought progressed compared to the uncoated seeds.

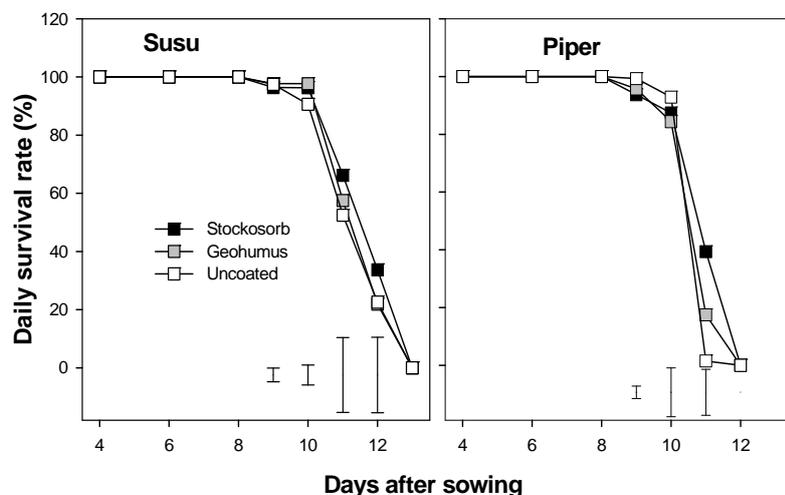


Figure 2 Effect of seed coats containing hydro-absorbers on the daily survival rates of two sorghum varieties (Susu and Piper) grown in sand under progressive drought. Bars represent the least significant difference between means for each day.

Seedling survival under conditions of progressive drought was strongly affected by seed coats containing hydro-absorbers. Larger numbers of coated seeds survived similar intensive drought stress as compared to the uncoated seeds

considering that both express similar drying slopes (data not shown). Coats containing Stockosorb supported seedling survival better than coats containing Geohumus. For seedlings from Stockosorb coated seeds survival rates of 30 to 40% were recorded at residual soil moisture of about 6% at 11 and 12 days after sowing for Piper and Susu respectively. Due to the small volume of the pots all seedlings died at 13 days after sowing without irrigation.

Conclusion

Coating sorghum seeds with hydro-absorbers improved seedling establishment and early seedling vigor during drought stress. The coatings confer a degree of protection against wilting in early drought leading to higher seedling survival rates. Hydro-absorbers differ in their effect, probably due to differences in composition and coating effectiveness. Observed varietal differences were small, however, effects on varieties clearly differing in their drought tolerance need to be investigated in more detail. Ongoing studies are being carried out to determine the effect of different speed of soil drying on survival rates as well as validating the vigour of surviving seedlings by re-watering to determine re-establishment rates at different points over time.

References

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