Sugarcane Flood Tolerance: Current Limits and Future Prospects

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Purpose

Discuss Sugarcane Flood Tolerance

Limits
Purpose

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- Physiological and morphological explanations.
  - Limits
Purpose

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- Speculate on future gains.
  - Limits
  - Physiological and morphological explanations.
Purpose

Discuss Sugarcane Flood Tolerance

- Possible ecological and hydrological applications
  - Limits
  - Physiological and morphological explanations.
  - Speculate on future gains.
Sugarcane Flood Tolerance
After Planting – Furrow Open

Before November, about 10 days.


Sugarcane Flood Tolerance
After Planting – Furrow Closed

2 Days Maximum

Except

CP 89-2376 can tolerate 4-6 days
Sugarcane Flood Tolerance During Summer Growth

Upper duration is unknown.

3 months flood causes substantial yield loss.

Periodic Flood Tolerance During Summer Growth

Nine cycles of 2-days flood followed by 12 days drainage resulted in moderate yield improvements.

Periodic Flood Tolerance During Summer Growth

Nine cycles of 7-day floods followed by 14 days drainage resulted in no effect on one genotype and substantial yield loss in a second genotype.

Periodic Flood Tolerance During Summer Growth

Five cycles of 7-day floods followed by 14 days drainage resulted in no effect on yields of 4 cultivars.

Periodic Flood Tolerance During Summer Growth

20 cm water-table depth caused yield reductions compared with the 45 cm water-table depth in 3 of 4 cultivars.

Flood Tolerance Prior to Harvest

Floods of up to 3 week durations did not reduce yields when applied about 6 weeks prior to harvest.

Explanations of Flood Tolerance

Photosynthesis, stomatal conductance, and transpiration not affected by flood or shallow water-table depth.

Explanations of Sugarcane Flood Tolerance

Roots of all 40 sugarcane genotypes tested in Florida had aerenchyma.

Explanations of Sugarcane Flood Tolerance

Stalks of all sugarcane genotypes tested in Florida form aerenchyma after being flooded.
Explanations of Sugarcane Flood Tolerance

However, only some genotypes form aerenchyma in stalks without exposure to flood; this provides extra flood tolerance.

Explanations of Sugarcane Flood Tolerance

Still a theory.

Sugarcane root growth is decreased when roots must grow into water. However, sugarcane roots appear to meet the needs of the plant when flooded for up to 2 weeks.
Conclusions

Most commercial sugarcane cultivars in Florida can tolerate floods for 1 to 2 weeks.
Conclusions

Continuous shallow water tables (15-20 cm) are more harmful to sugarcane than periodic flooding.

Commercial sugarcane cultivars can tolerate floods for 1 to 2 weeks.
Conclusions

Sugarcane has physiological and morphological traits that allow it to respond well to short-duration floods.

Commercial sugarcane cultivars can tolerate floods for 1 to 2 weeks.

Continuous shallow water tables (15-20 cm) are more harmful to sugarcane than periodic flooding.
Strategies

• Strategies to store water on sugarcane fields should be based on knowledge that sugarcane can tolerate 1-2 weeks of flood.

• Research should focus on extending this duration.
Strategies

Perhaps sufficient on-farm water storage can be accomplished by movement of water among sugarcane fields.
Flooded 1 week, then drained to Field B
Thank you

Questions?
Comments?