

Benefits of Cover Crops for Water Conservation

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Need for

Water Conservation

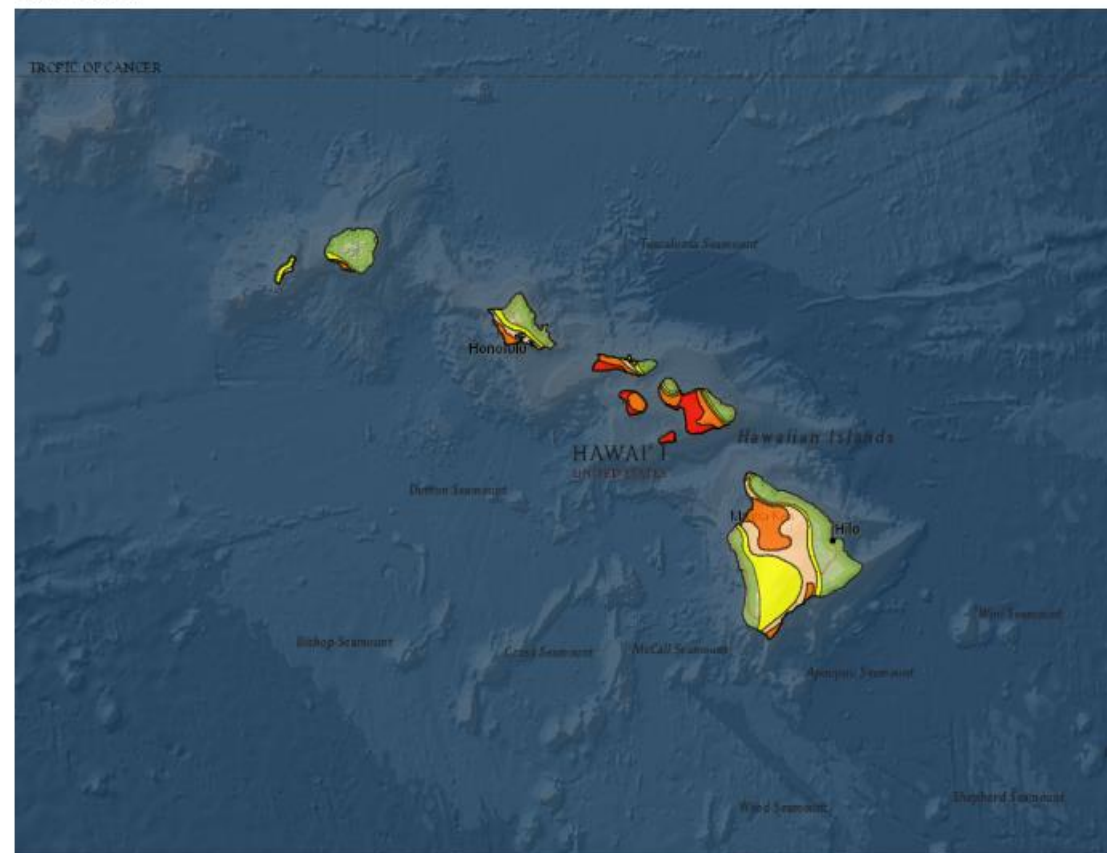


Water limitation severely affects crop production and our food security.

In Hawaii, severe drought experienced between 2012 and 2017 reduced irrigated farmland by 45%.

Soil health management can help to manage drought.

Current U.S. Drought Monitor Conditions for Hawaii: Current



Basemap Sources: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA,

U.S. Drought Monitor for HI

INCREMENT P



Source(s): NDMC, NOAA, USDA

Updates Weekly - 10/19/21

Drought.gov

Cover crops

Diverse group of plant species that can be grown together or in rotation with the cash crops and provide various ecological benefits to the agroecosystem.

Benefits of cover cropping:

- Erosion control
- Reduction in nutrient leaching
- Water conservation
- Organic matter addition
- Weed and soil-borne disease suppression
- Enhancement of soil microbial activities



Sorghum/Sorghum-sudangrass (SSgH)

- Larger amount of biomass – thick mulch can lead to soil moisture conservation
- Deep root system –drought tolerant and nutrient scavenging, improve soil structure
- Tolerate high and low soil pH
- Root leachate is weed suppressive (Sorgoleone)
- Shoot tissues release HCN (nematicidal) upon hydrolysis of dhurrin (= Biofumigation)



Objectives

Evaluate SSgH varieties most efficient in water conservation in

1. **No-till system**
2. Low-till system



Sorghum/Sorghum-sudangrass hybrids (SSgH)

Forage Sorghum



- Big Kahuna Plus
- Bundle King

Sudangrass



- Piper

Sorghum-Sudangrass hybrid



- Latte
- Latte BMR
- 51214

Energy sorghum



- NX 4264
- NX-D-61

Obj 1a. Evaluate SSgH for water conservation properties in a no-till system

Field Trial at Poamoho Station

- Treatments – 7 SSgH varieties and one bare ground control ($3.6 \times 1.2 \text{ m}^2$)
- Terminated with a flail mower at 2.5 months.
- Planted eggplants.



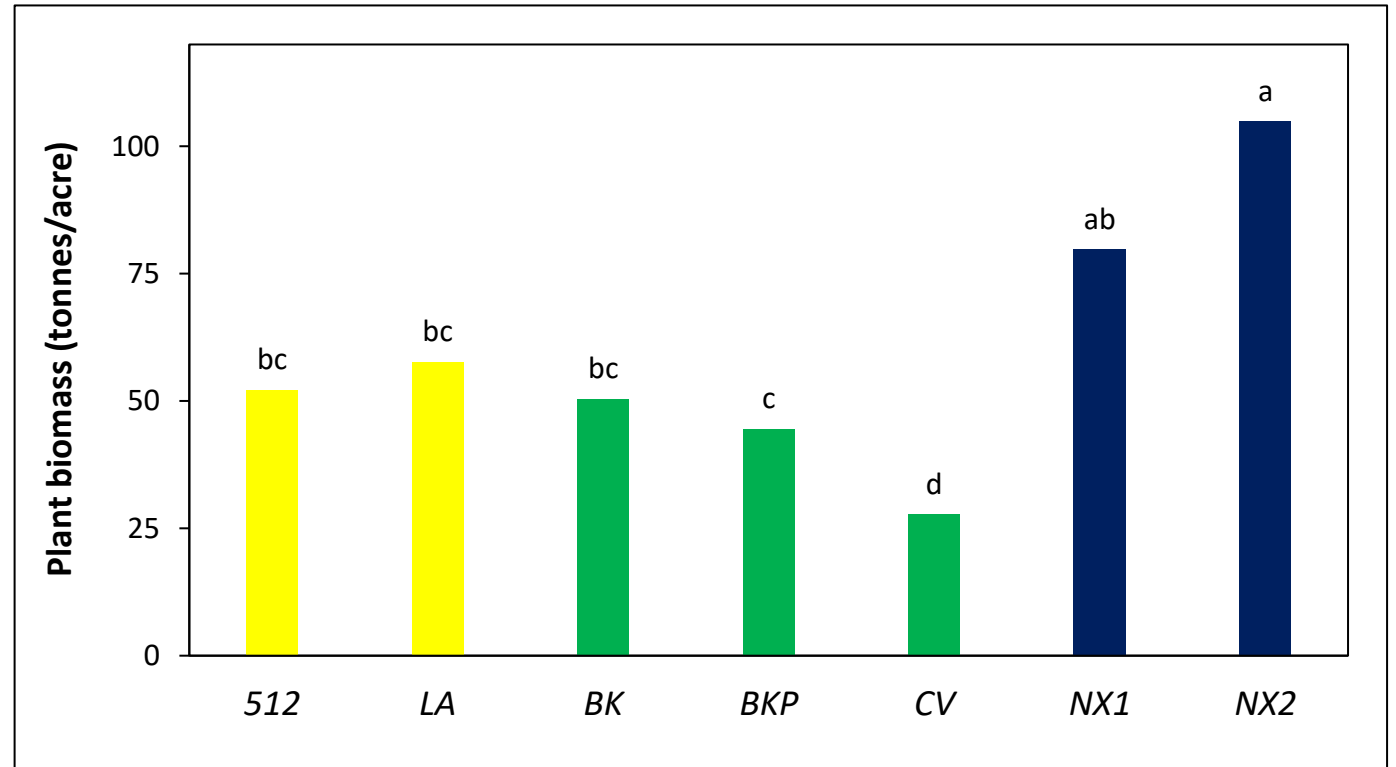
Data collection

- SSgH biomass was estimated 2.5 months after planting SSgH.
- Volumetric soil moisture (VSM) was measured at 2-month intervals after eggplant transplanting.
- Infiltration rate was estimated 2 months after planting cover crop, and 3 month after planting eggplant.



Results: SSgH Biomass

Greater biomass means more mulching
effects on soil surface that can reduce
evaporation of water



Sorghum-
sudangrass hybrid

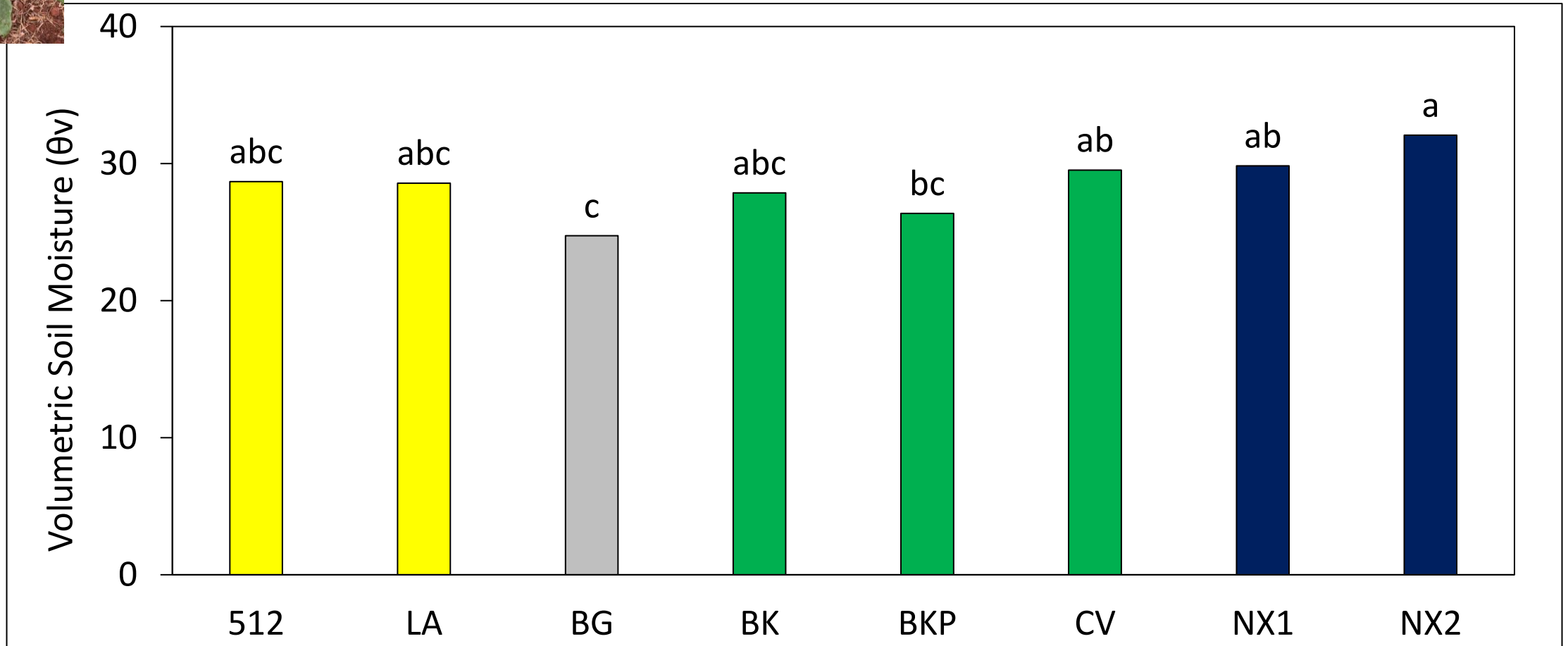
Forage sorghum

Energy sorghum

Energy sorghum > sorghum-sudangrass > forage sorghum



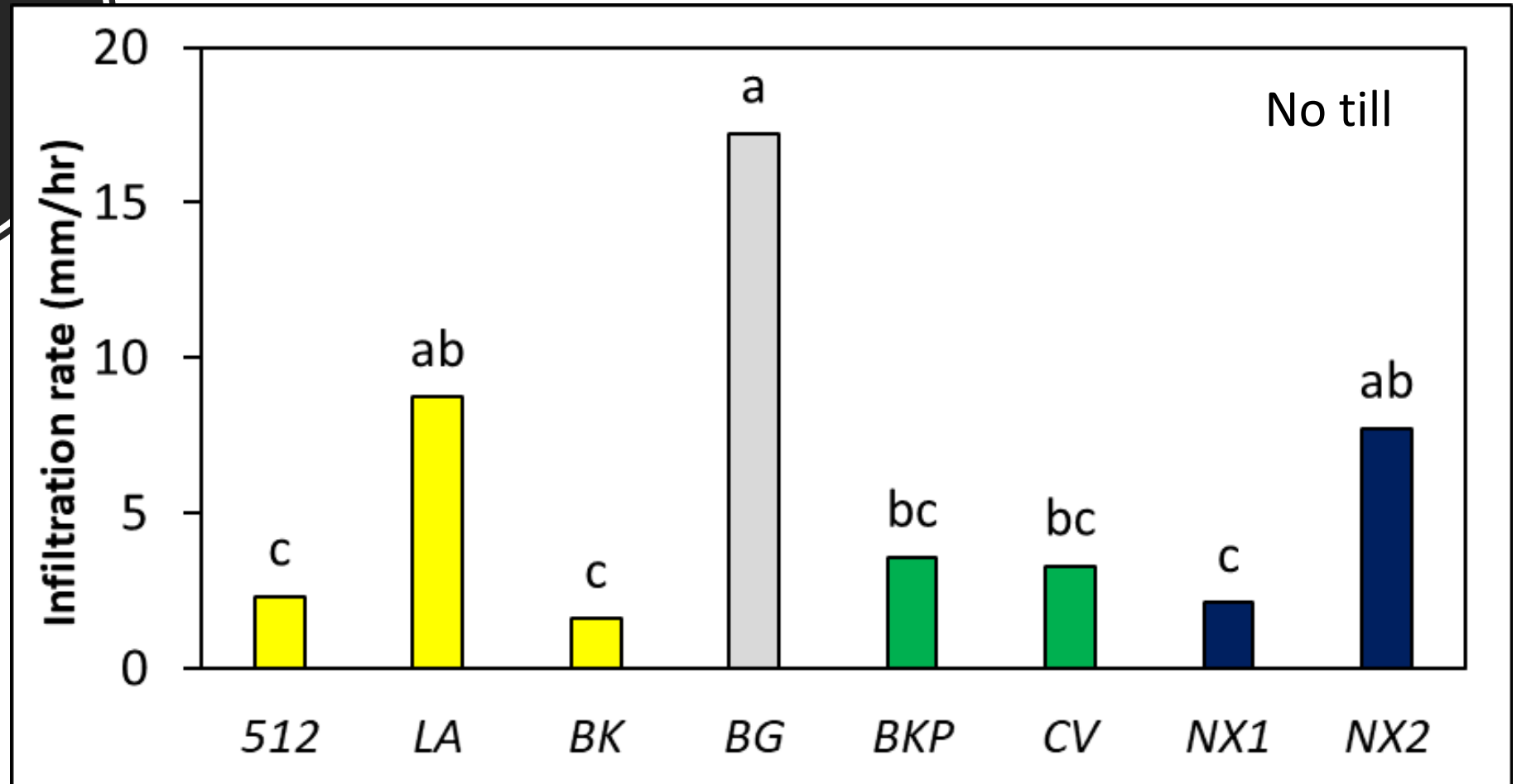
Soil Moisture



Only energy sorghum (NX1, 2) and CV increased volumetric soil moisture throughout the 5 months of eggplant crop.

Infiltration

Infiltration rate estimated at 2 months after planting cover crop,
and 3 month after planting eggplant



Objectives

Evaluate SSgH varieties most efficient in water conservation in

1. No-till system
2. **Low-till system**



Sorghum/Sorghum-sudangrass hybrids (SSgH)

Forage Sorghum



- Bundle King

Sudangrass



- Piper

Sorghum-Sudangrass hybrid



- Latte
- 51214
- 542
- 5355

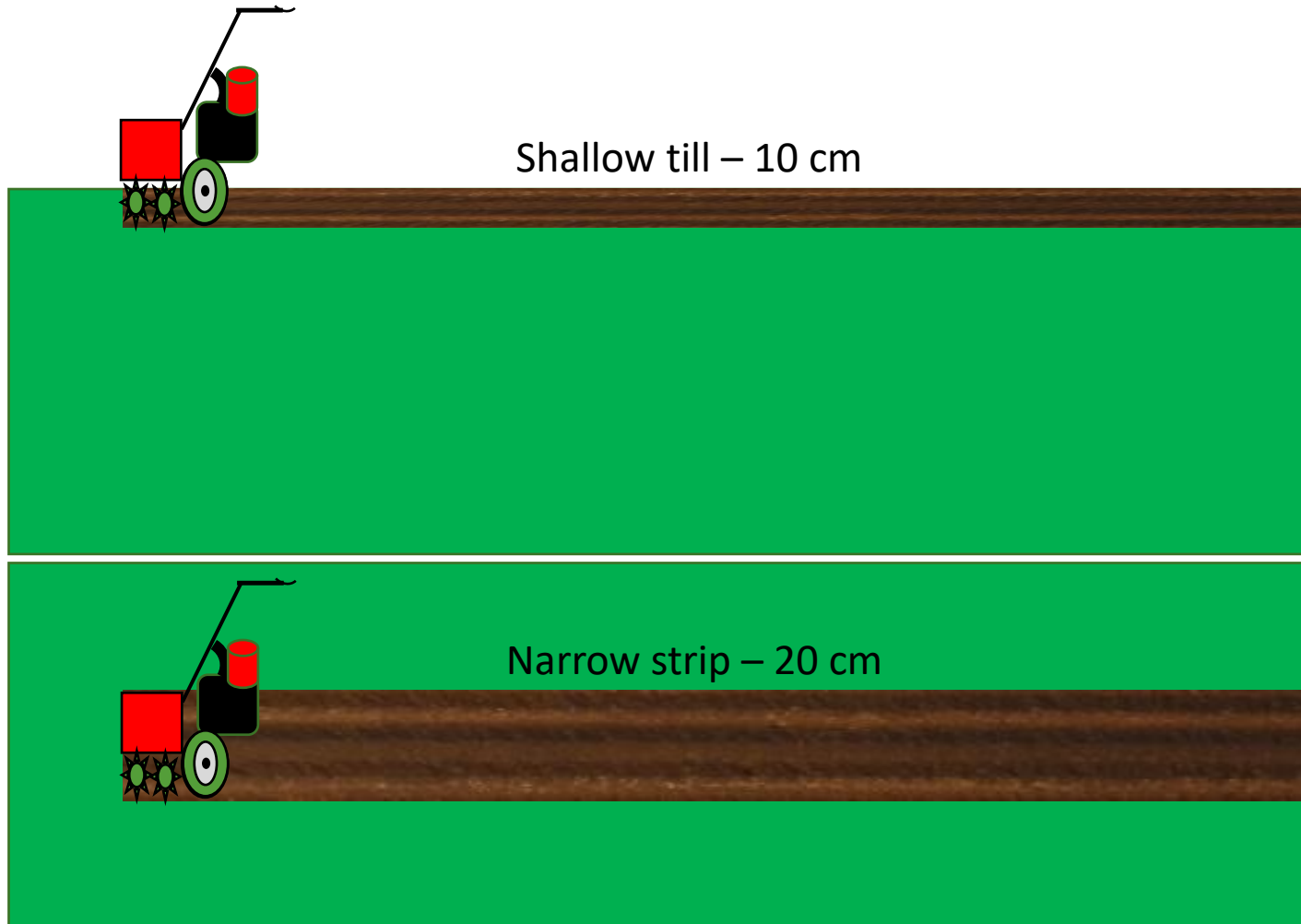
Energy sorghum



- NX-D-61

What is Low-till?

Conservation tillage = tillage system that leaves at least 30% residue cover on the soil surface after planting. It can be no-till with 100% residues on soil surface, or reduced till, strip-till, low till.



Reasons for Low –Till:

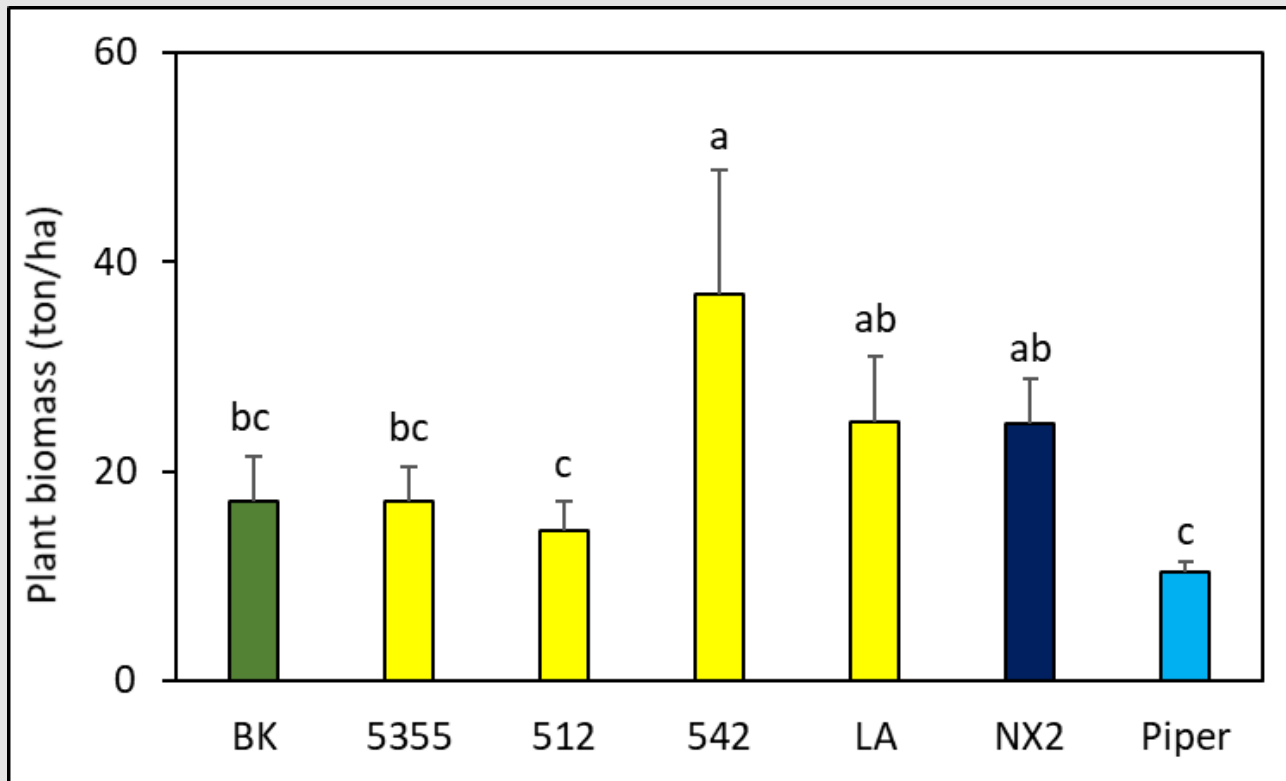
1. creating a shallow plow area easier for new crop roots to establish than no-till
2. allowing new roots to reach root channels left over from SSgH,
3. preserving hyphal networks left from SSgH cover crop in > 30% of the untilled area,
4. minimizing disturbance to weed-seed bank in the weed germination zone usually the top 10-cm of soil,
5. allowing effective dhurrin biofumigation when some of the biomass are soil incorporated.

Obj 1b. Evaluate SSgH for water conservation properties in low-till system



- 7 SSgH varieties and one bare ground control (3.6×1.2 m²/plot).
- Terminated with a BCS operated flail mower at 2.5 months.
- Strip till of 20-cm wide and 10-cm deep strip for all SSgH plots.
- Planted eggplant seedlings.
- Data collection similar to Objective 2. i..

Plant biomass

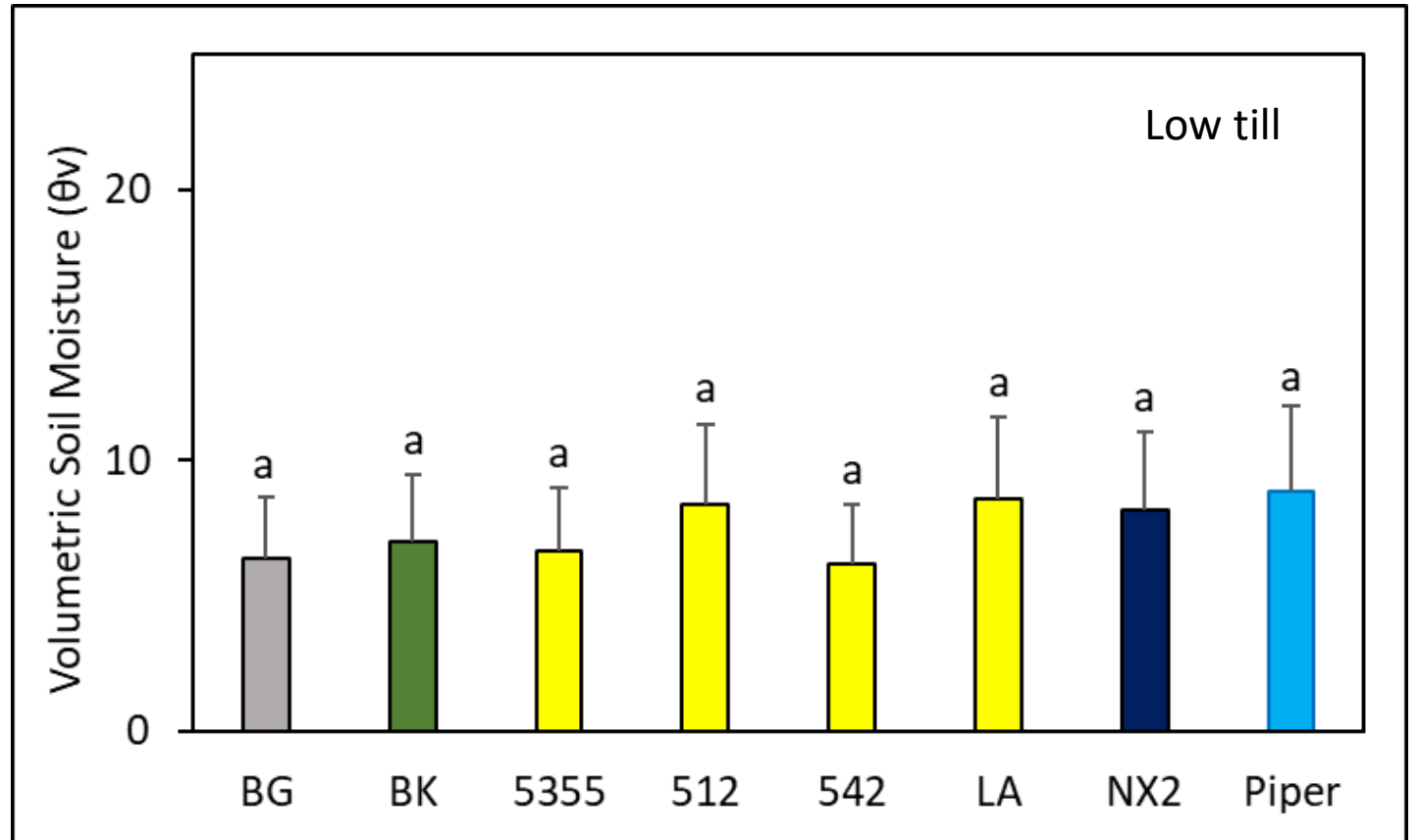


- 542 produced the highest biomass followed by 'NX2' and 'LA'.
- 'Piper' and '512' produced the least.



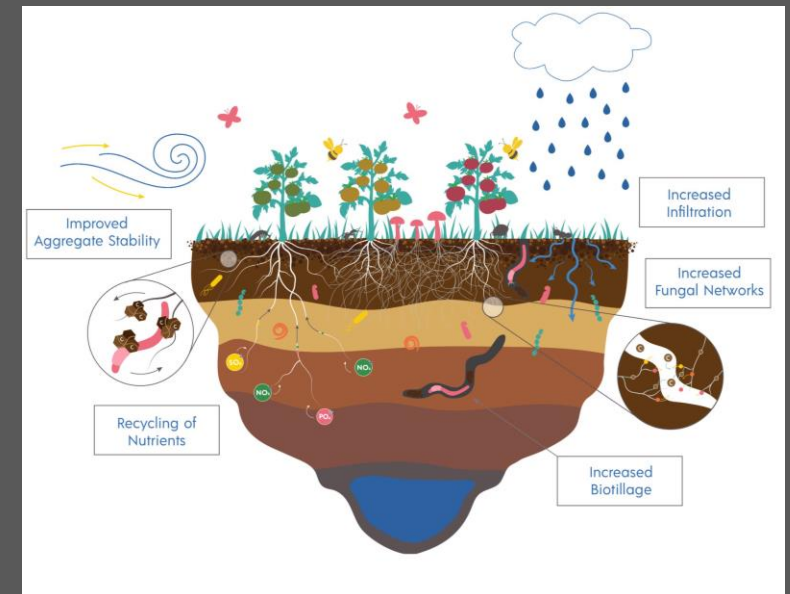
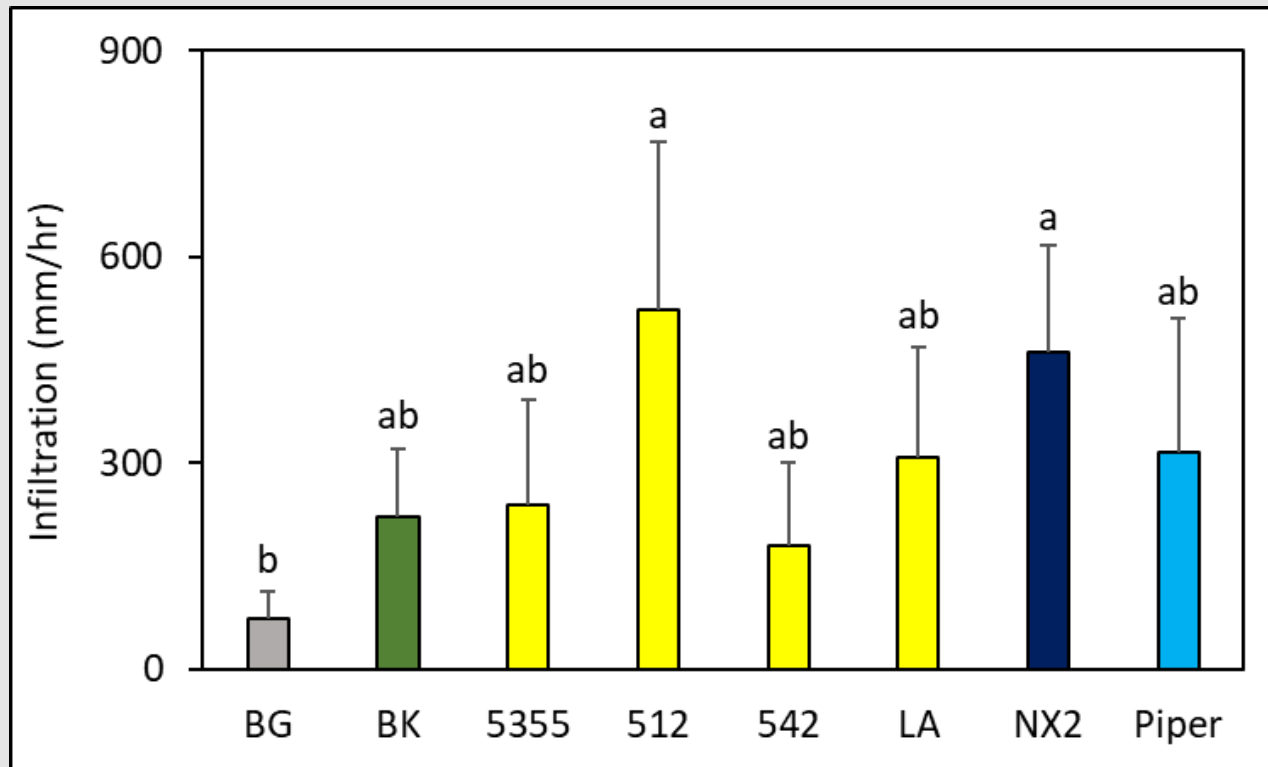
Soil moisture

Soil moisture estimated at the time of termination of cover crop



SSgH in a low-till system improved water infiltration

- 'NX2' and '512' increased water infiltration by 5 and 6 folds, respectively.

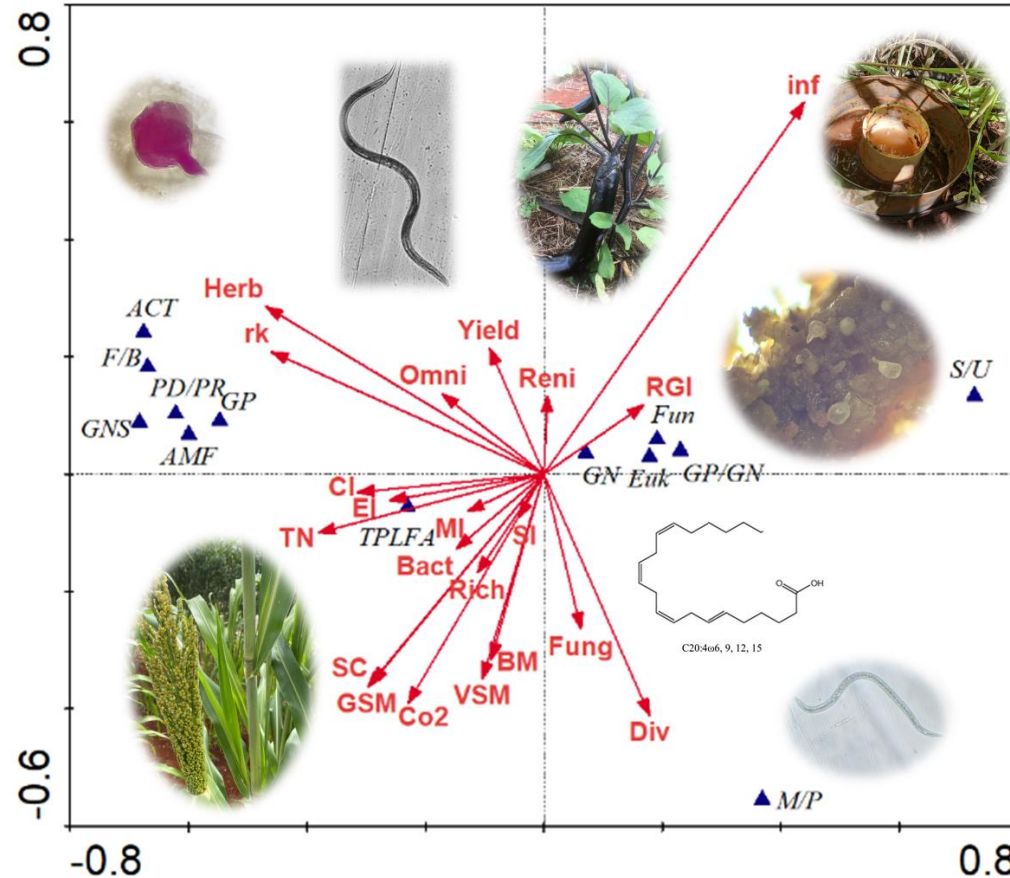


Conclusion

- Sorghum/Sorghum-Sudangrass cover cropping improved soil moisture and water infiltration in a no-till and low-till agroecosystem.
- More data from the field trials will help us determine the best cultivar.
- We are also measuring other soil health aspects such as organic matter, soil microbial activity, and plant-parasitic nematode management in the field experiment.

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