

Development of Photo-Switching Ocean-Degradable Plastics with Edibility

⑤ Development of Sorghum Varieties Optimized as Feedstock for Photo-Switching Ocean-Degradable Plastics

⑤ – 1

Development of varieties optimized root systems for high biomass yield

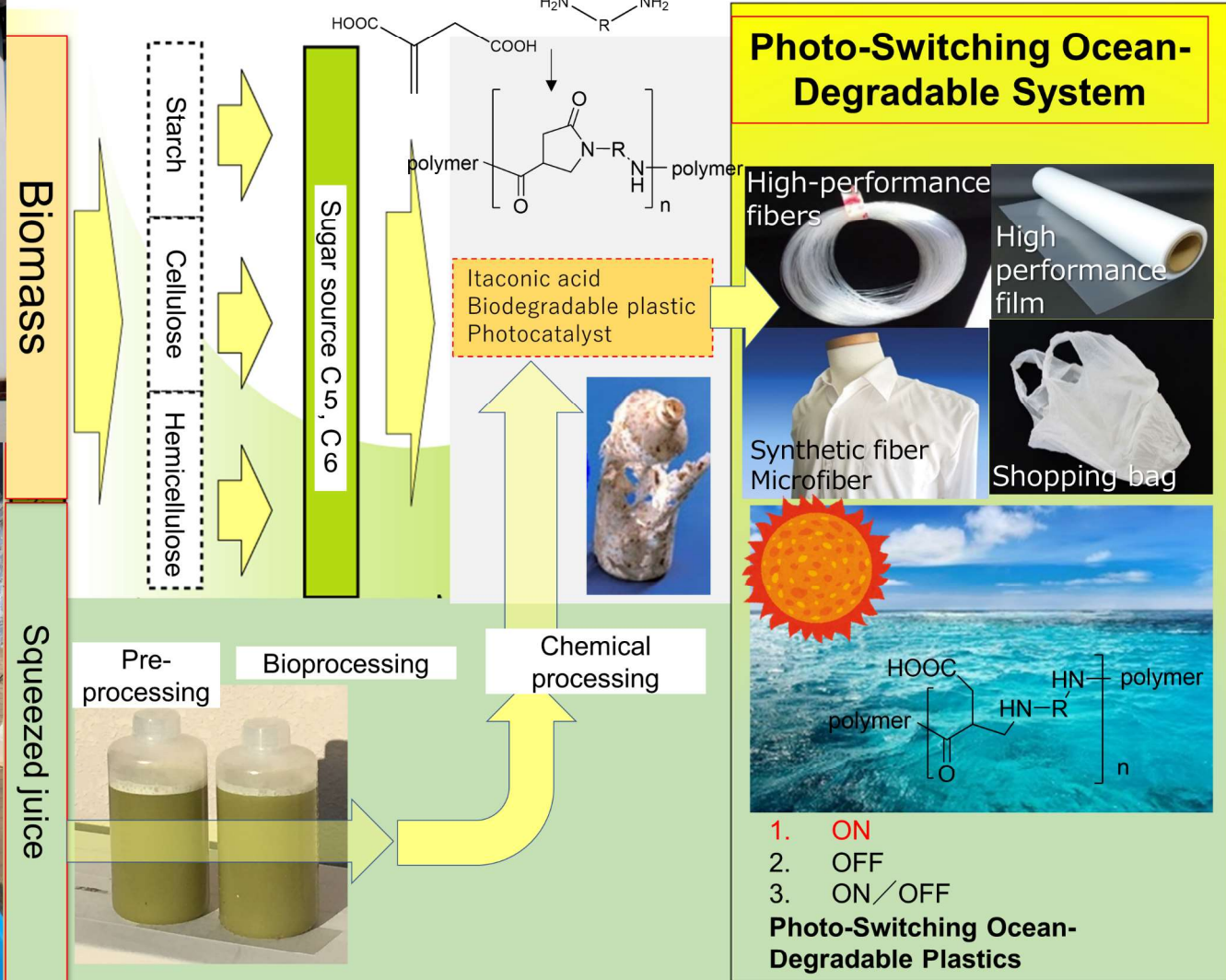
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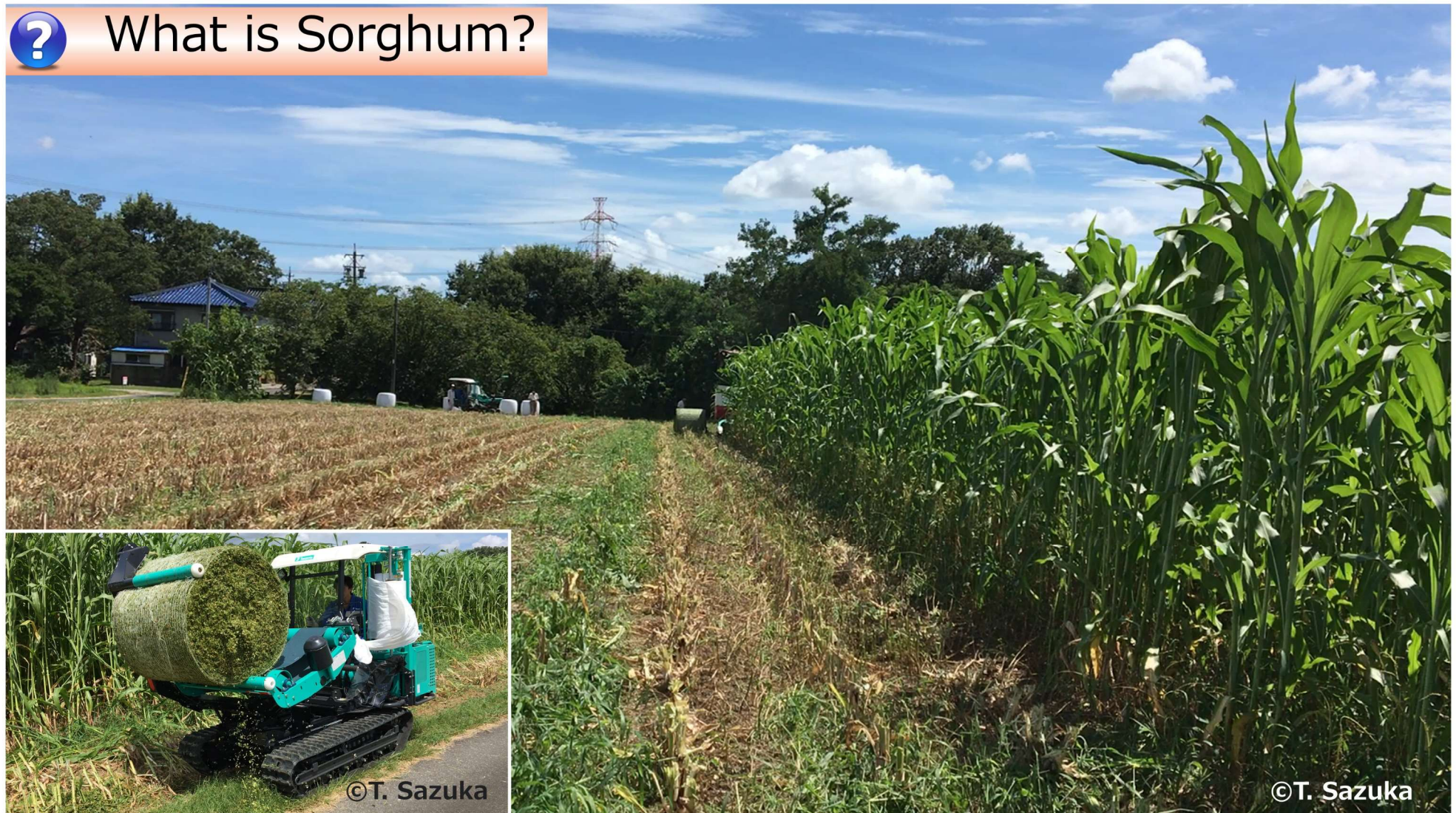
Implementing organizations : Japan Advanced Institute of Science and Technology, Kobe University, Nagoya University, Kagoshima University, Tokyo University of Science, Tokyo University of Agriculture and Technology, National Institute of Advanced Industrial Science and Technology(AIST), Osaka Research Institute of Industrial Science and Technology(ORIST).

How to produce the "carbon source" as the feedstock for biorefinery?





What is Sorghum?



- ~85 t/ha
- Diploid (ideal for genomic breeding)
- C4 Plant
- Stem and leaf are used for Livestock feed
- Sweet sorghum accumulates sugar in stems

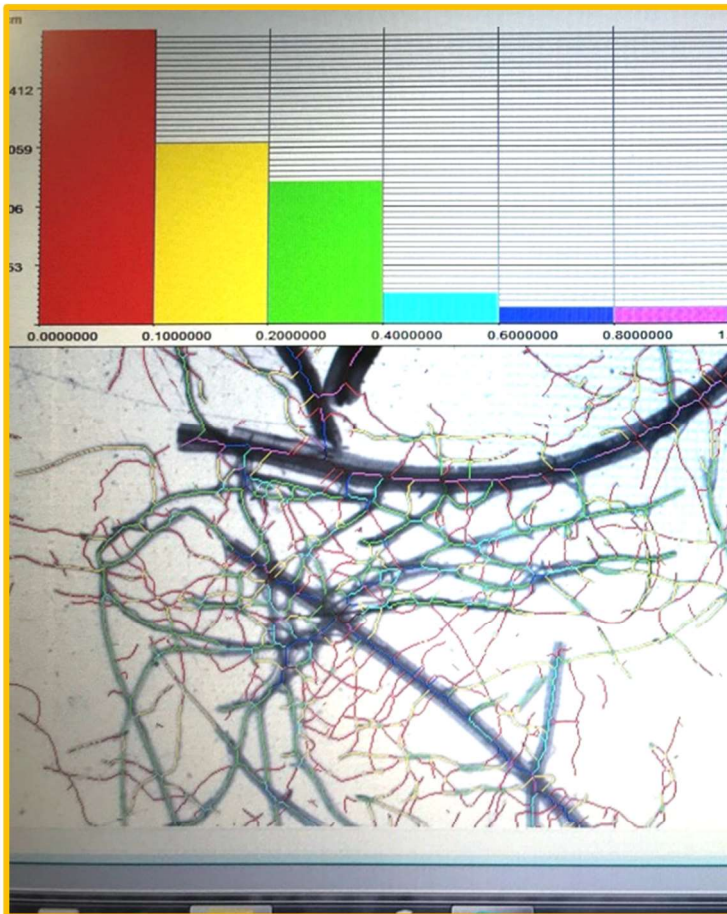
- Wide growing area (equatorial to temperate)
- Drought and salt tolerances
- Use of abandoned cultivated zone

Schedule: Development of varieties with an optimized root system for high biomass yield

	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025-2029
Root system and culm biomass Trait evaluation (Yamauchi, Inukai)	Preliminary study of root system using model varieties	Evaluation of root systems of 20-30 varieties				
Set up infrastructure of genome information (Nishiuchi)	Genome sequencing of the sorghum collection	Additional sequencing				

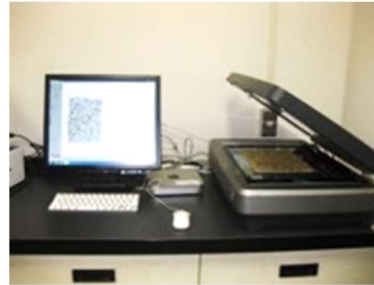
② Evaluation of core collection

Establishment of a root system evaluation system using 10 varieties

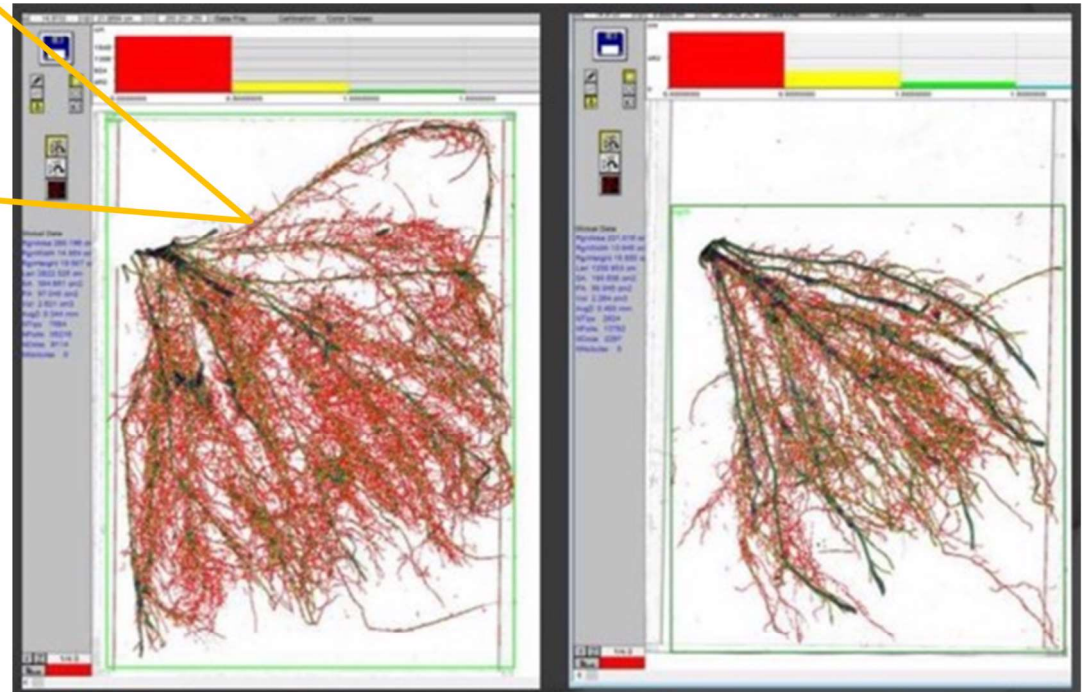


Analysis of root morphology with WinRHIZO

Scanner & image analysis

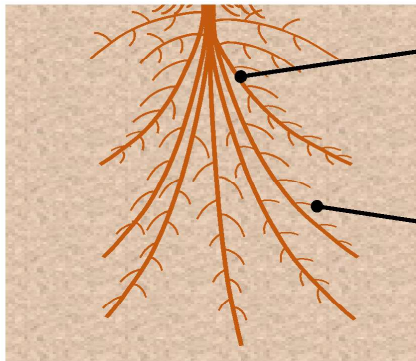


Length measurements each root types



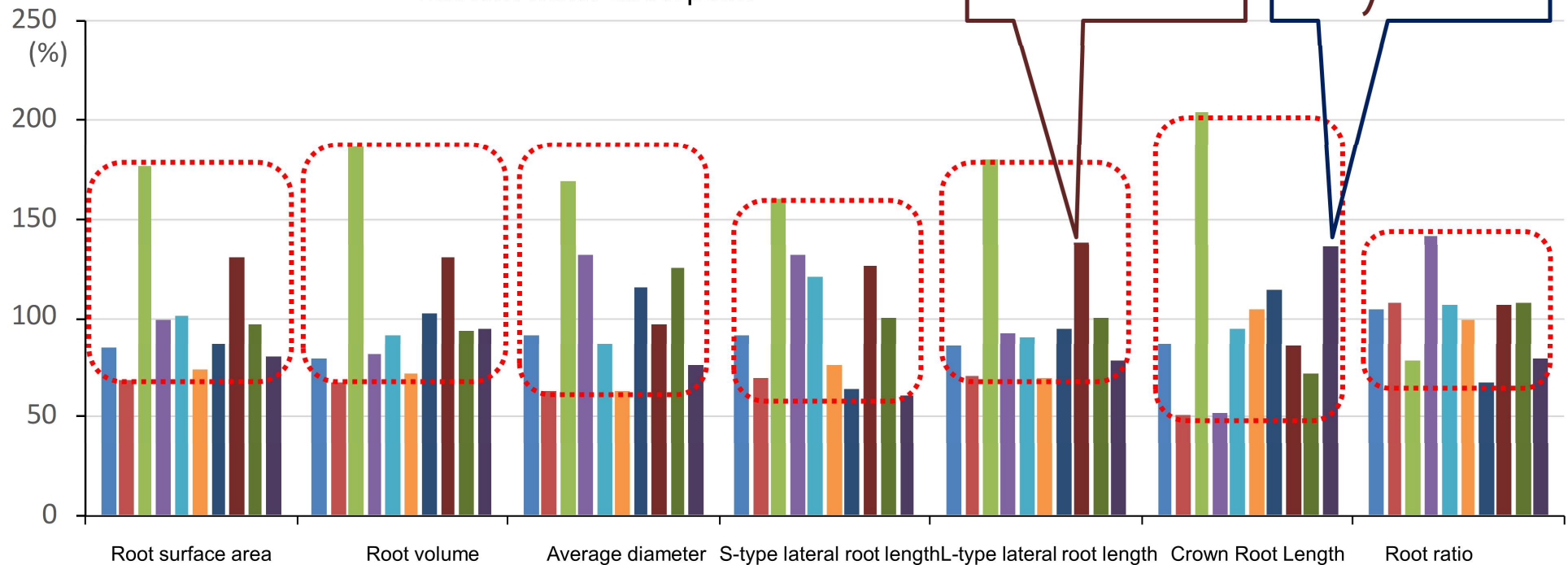
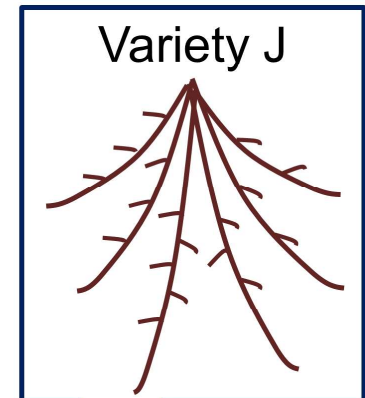
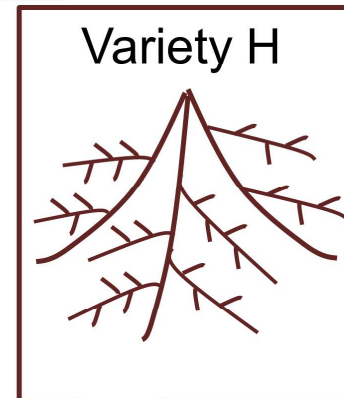
Results: Root system are highly diversified

On going: 50 varieties



Crown root :
Mainly provides physical support to the underground and helps to increase the absorption of nutrients

Lateral roots:
Increases the surface area of roots, contributing to increased efficiency of nutrient water absorption



- A アメリカ USA
- B メキシコ Mexico
- C スーダン Sudan
- D 南アフリカ South Africa
- E オーストラリア Australia
- F ハンガリー Hungary
- G 日本 Japan
- H 中国 China
- I インド India
- J アフガニスタン Afghanistan

③ Evaluation of core collection

Development of genome database

World-wide collection (255 strains)



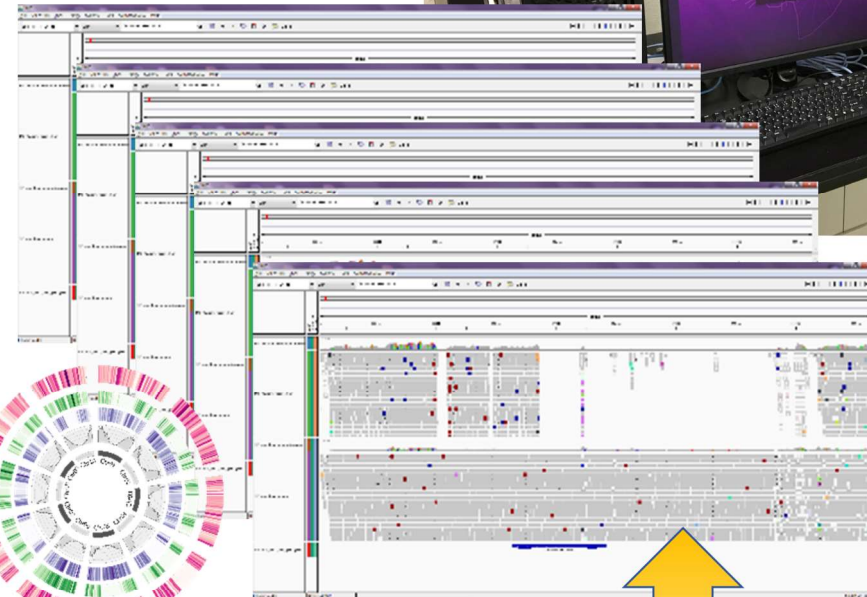
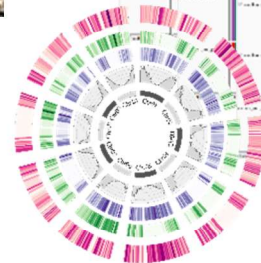
Extraction of genomic DNA of
255 varieties

Genomic DNA library

Whole genome sequencing
(247 strains)
(Genome size ~732Mb)



Database

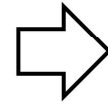


BAM

SAM

Assemble of the sequence
fragments of the 247 strains
(bwa-0.7.17)

New varieties with high biomass by
"optimized roots"



Maximizing biomass for
biorefinery

