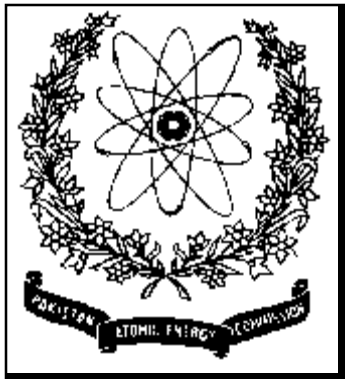

PERFORMANCE OF SOMACLONES UNDER FIELD CONDITIONS AT NIA, TANDO JAM

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Pr. Scientist /
PI sugarcane and molecular marker group

Agriculture is the oldest profession of mankind since civilization starts

Selective breeding led to higher-yielding varieties.

WHAT IS BIOTECHNOLOGY?

***United Nations Convention on Biological Diversity'*, defines biotechnology as:**

'Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use

Basic Features of Somaclonal Variations

- Calliclone (clones of callus),
- Mericlone (clones of meristem)
- Protoclone (clones of Protoplast) were produced.
- Variations for Karyotype,
- Heritable change (other than nuclear)

Mechanism of Somaclonal Variations

1. **Genetic (Heritable Variations)**

    - Pre-existing variations in the somatic cells of explant
    - Caused by mutations and other DNA changes
    - Occur at high frequency

1. **Epigenetic (Non-heritable Variations)**

Genetic Cause

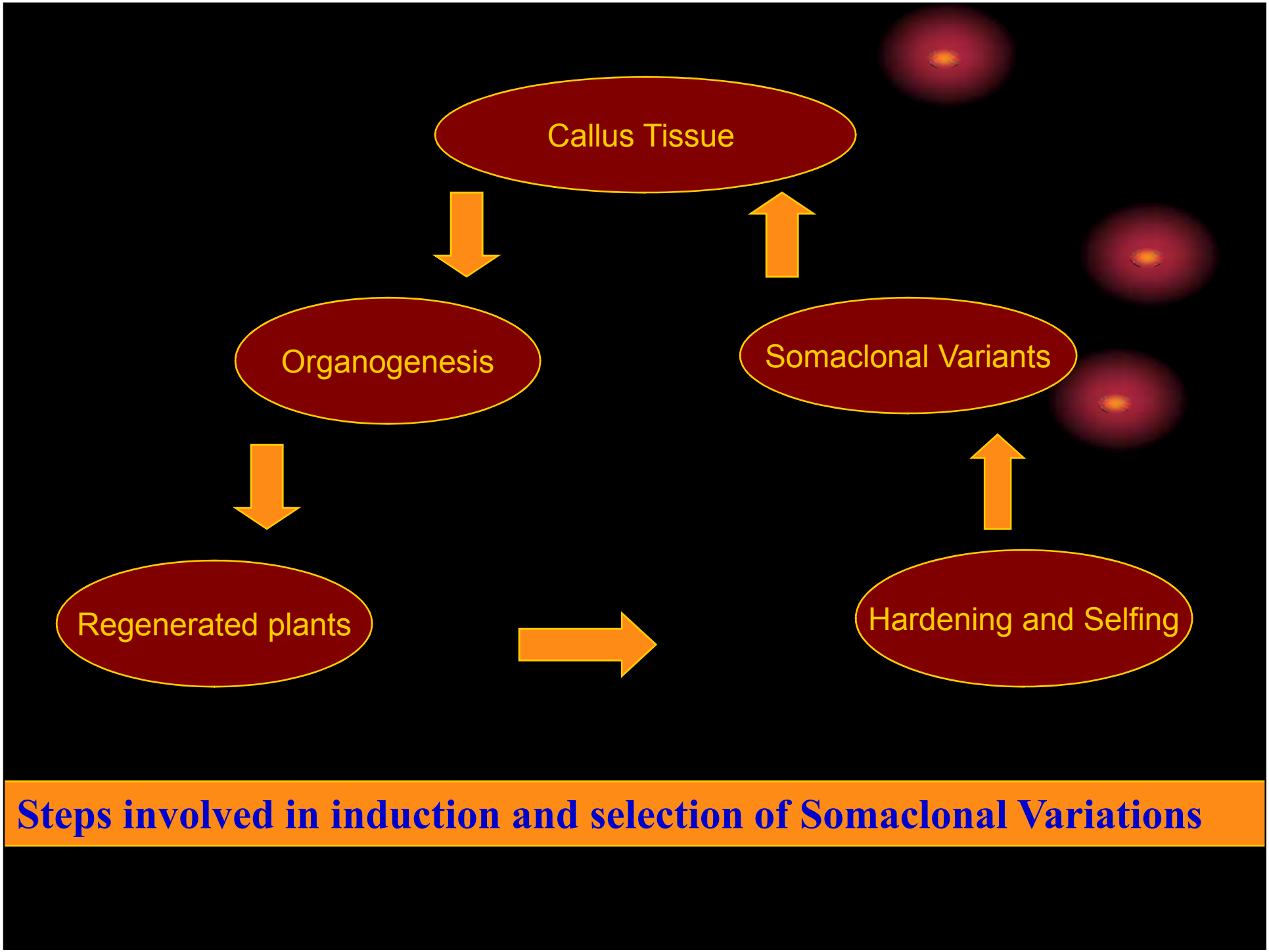
Gene Mutation

- **Tansition**
- **Transversion**
- **Insertion**
- **Deletion**

Transposable element activation

DNA sequence

- **Change in DNA, Change in Protein**



Steps involved in induction and selection of Somaclonal Variations

Biochemical Cause

- Lack of photosynthetic ability due to alteration in carbon metabolism
- Biosynthesis of starch via carotenoid pathway
- Nitrogen metabolism
- Antibiotic resistance.

Detection and Isolation of Somaclonal Variants

1. Analysis of morphological characters

2. Variant detection by cytological Studies
   - Staining of meristematic tissues like root tip, leaf tip with feulgen and acetocarmine provide the number and morphology of chromosomes.

3. Variant detection by DNA contents
   - Cytophotometer detection of feulgen stained nuclei can be used to measure the DNA contents

4. Variant detection by gel electrophoresis
   - Change in concentration of enzymes, proteins and hemical products like pigments, alkaloids and amino acids can be detected by their electrophoretic pattern

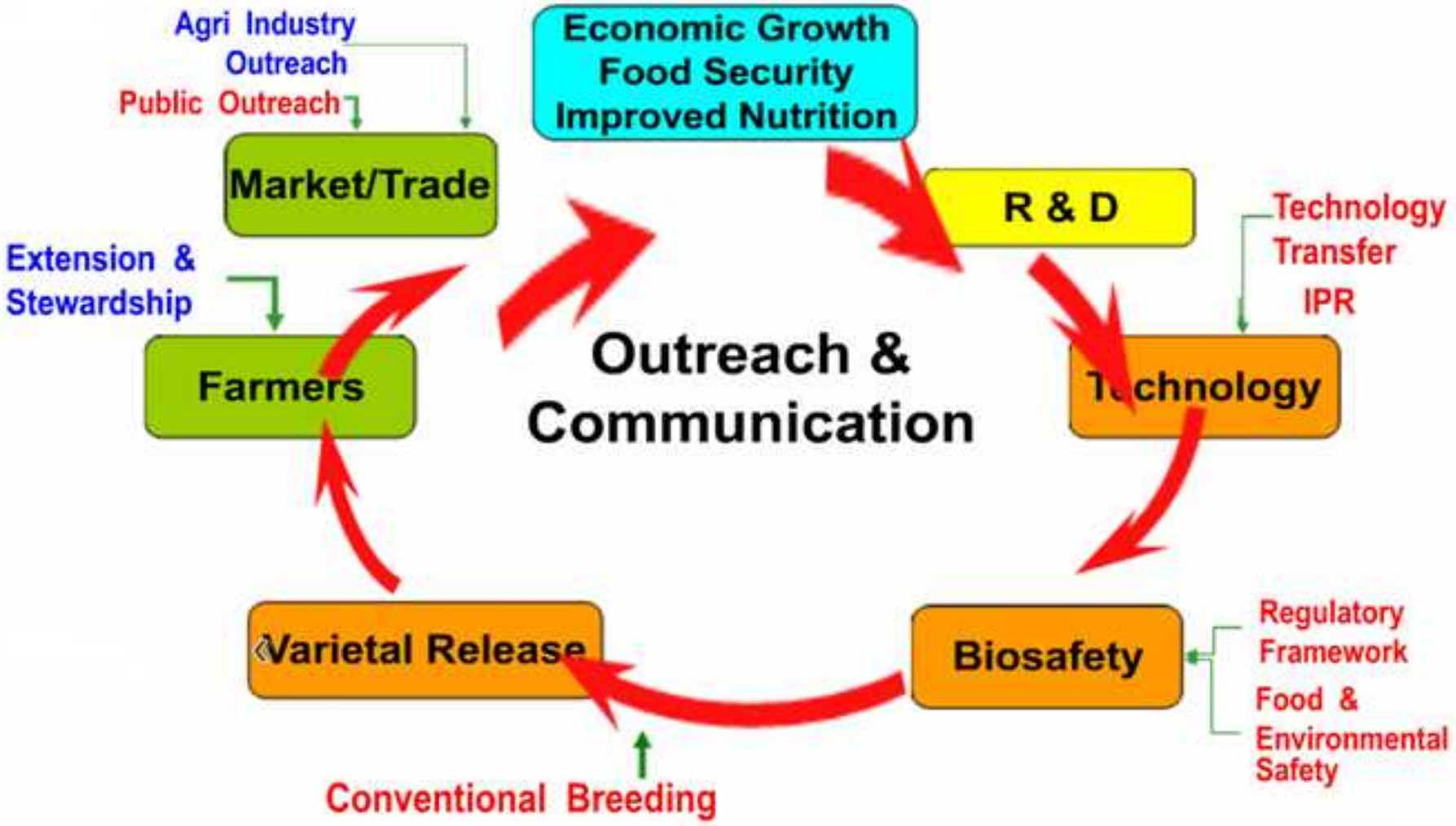
5. Detection of disease resistance variant
   - Pathogen or toxin responsible for disease resistance can be used as selection agent during culture.

6. Detection of herbicide resistance variant
   - Plantlets generated by the addition of herbicide to the cell culture system can be used as herbicide resistance plant.

Advantages of Somaclonal Variations

- Help in crop improvement
- Creation of additional genetic varitions
- Increased and improved production of secondary metabolites
- Selection of plants resistant to various toxins, herbicides, high salt concentration and mineral toxicity
- Suitable for breeding of tree species

Comprehensive Approach to Agricultural Biotechnology



Who are the stakeholders?

- Farmers

- Consumers

- **Agribusiness**

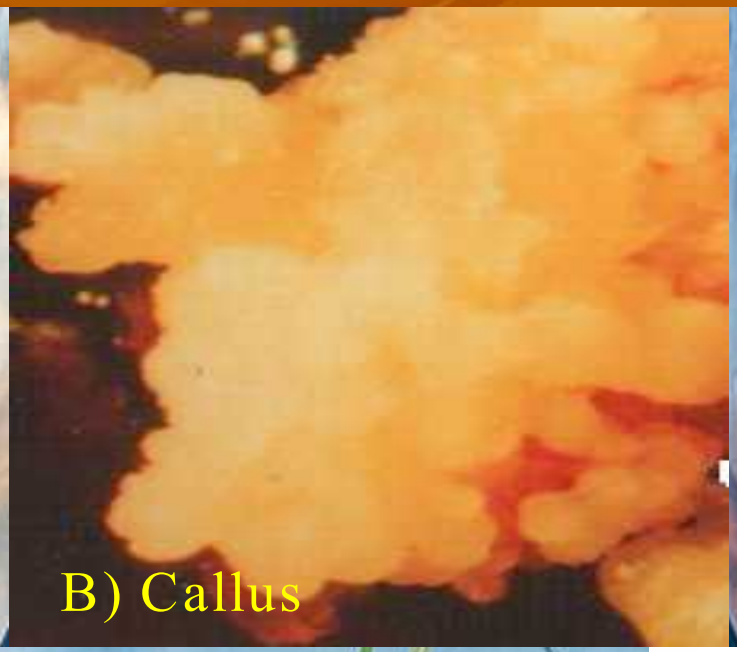
- **Industry**

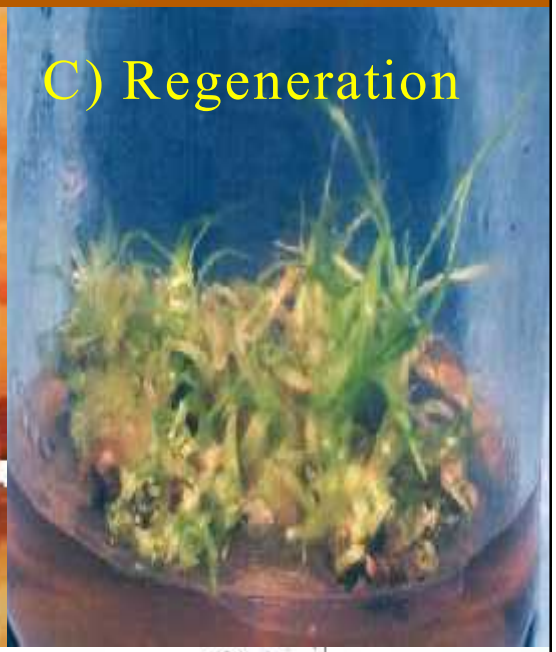
Biotechnological techniques used

- Callus culture
- Direct regeneration
- *In vitro* mutagenesis
- Micropropagation
- Somatic embryogenesis

Callus culture studies


A) Explant


B) Callus

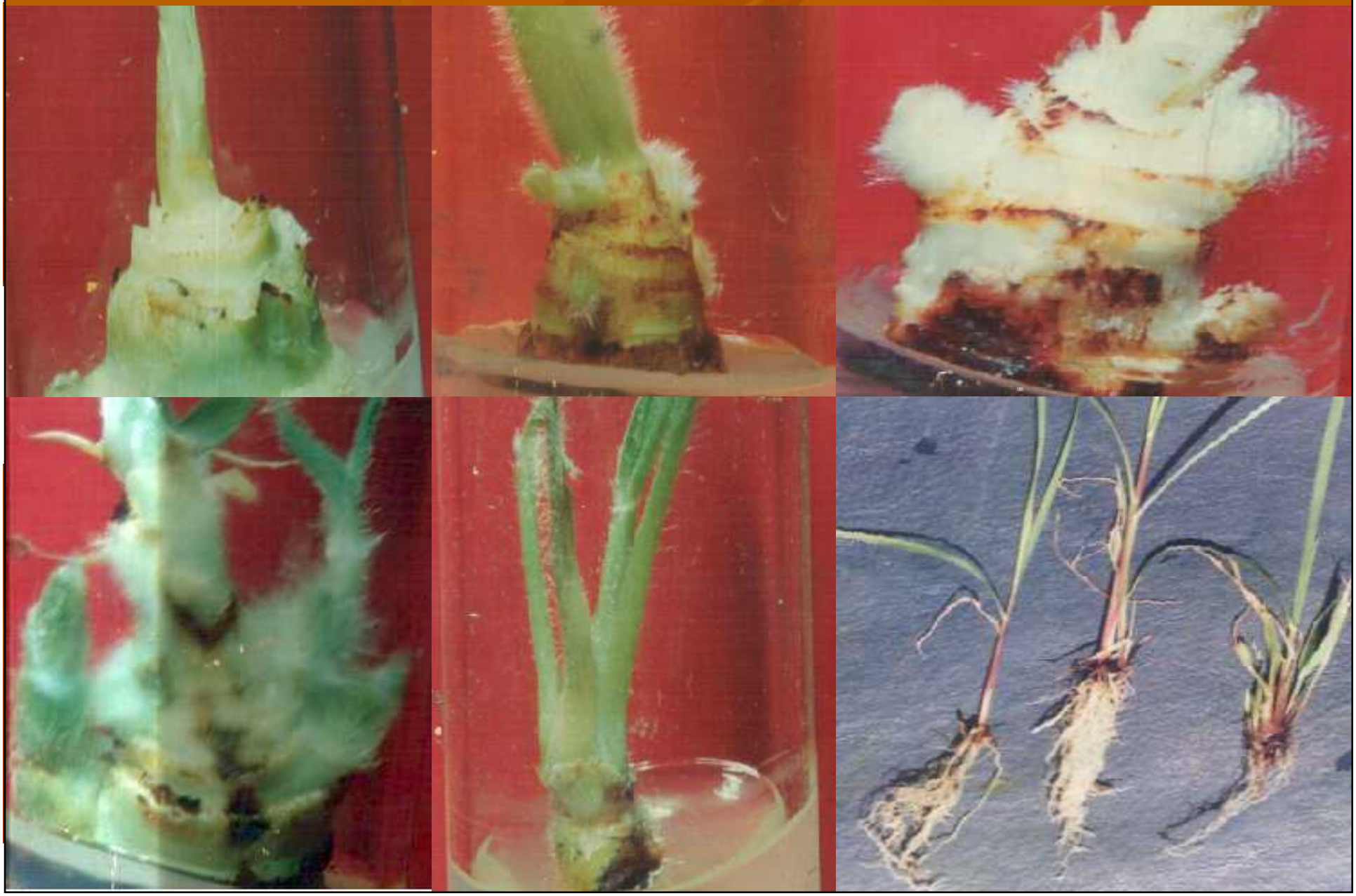

C) Regeneration

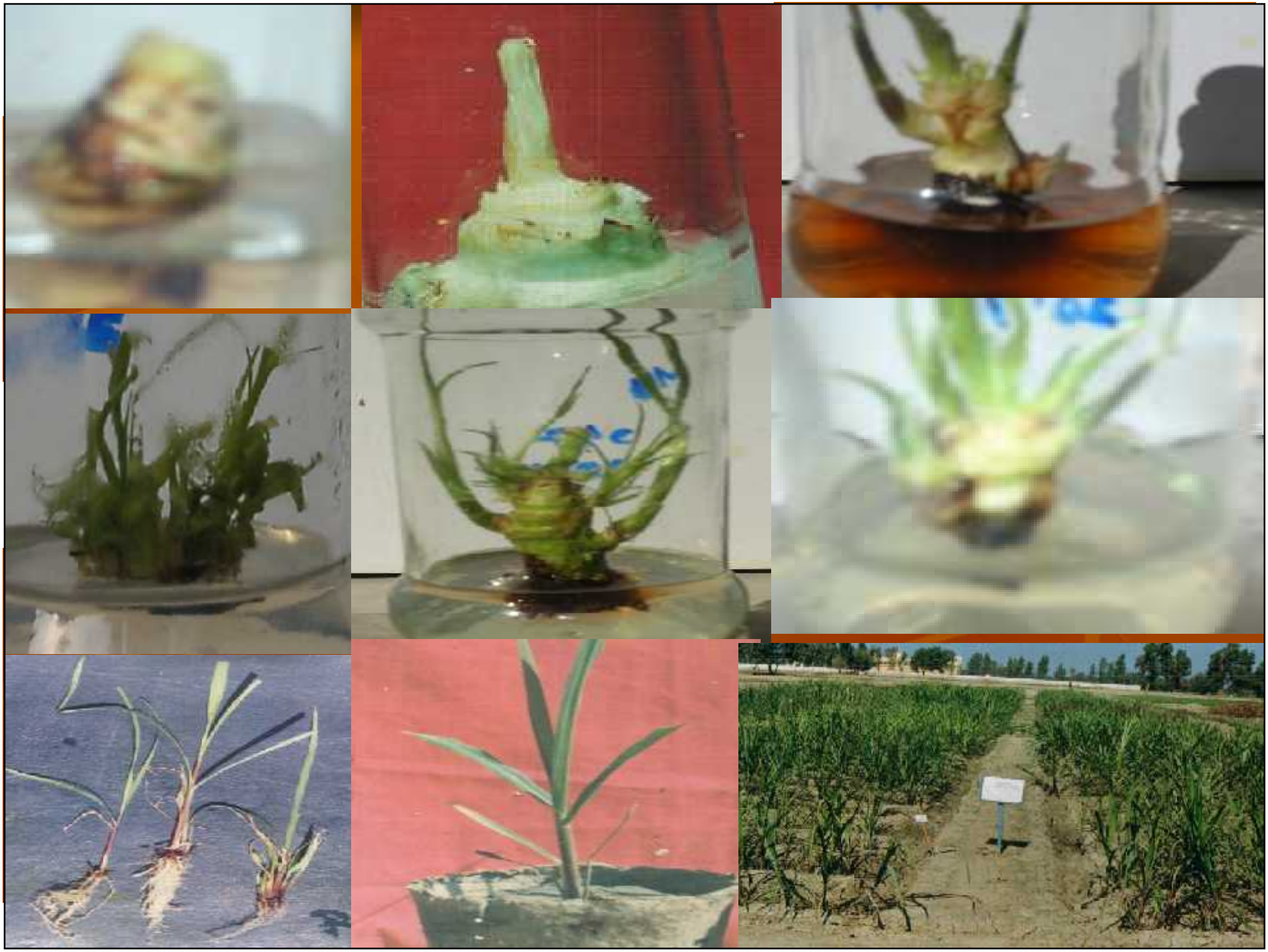

D) Rooted plantlets

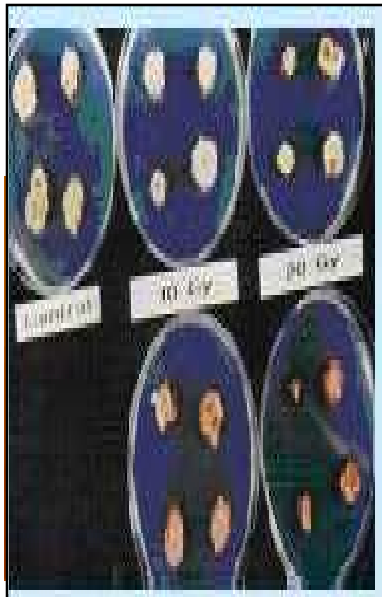

E) Plantlets in earthen pot


F)Plants in the field

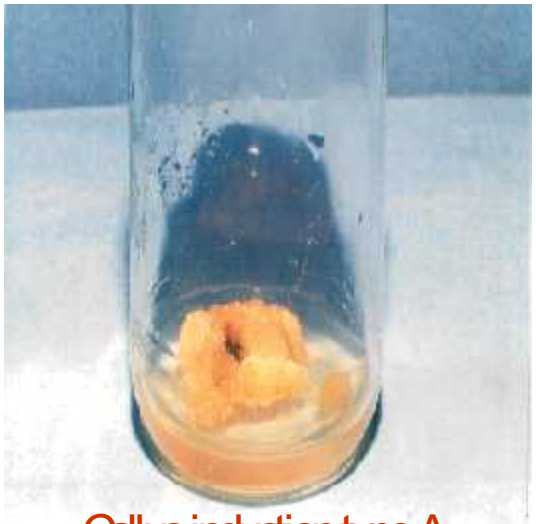
MICROPROPAGATION IN SUGARCANE







Explant of sugarcane

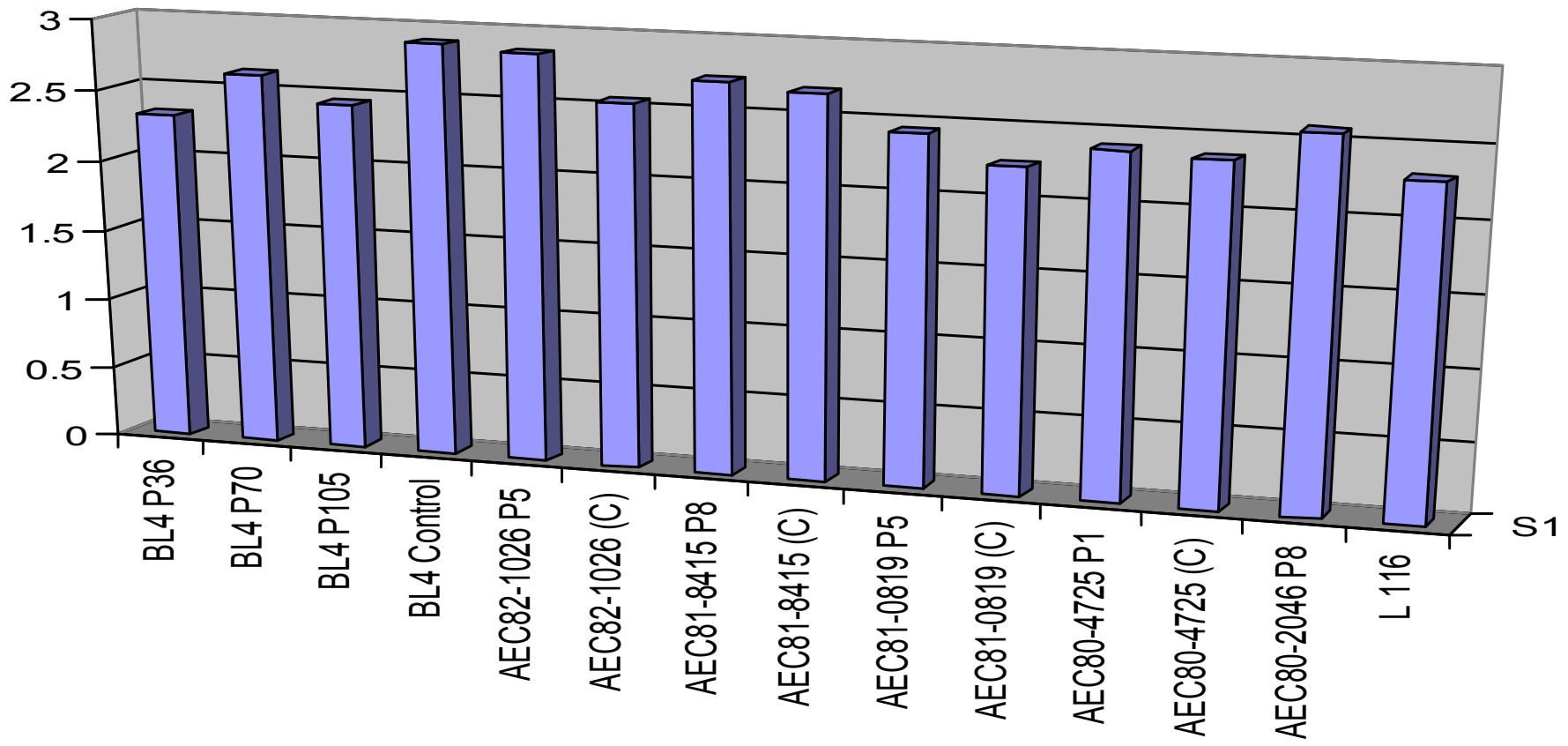


Callus induction type A

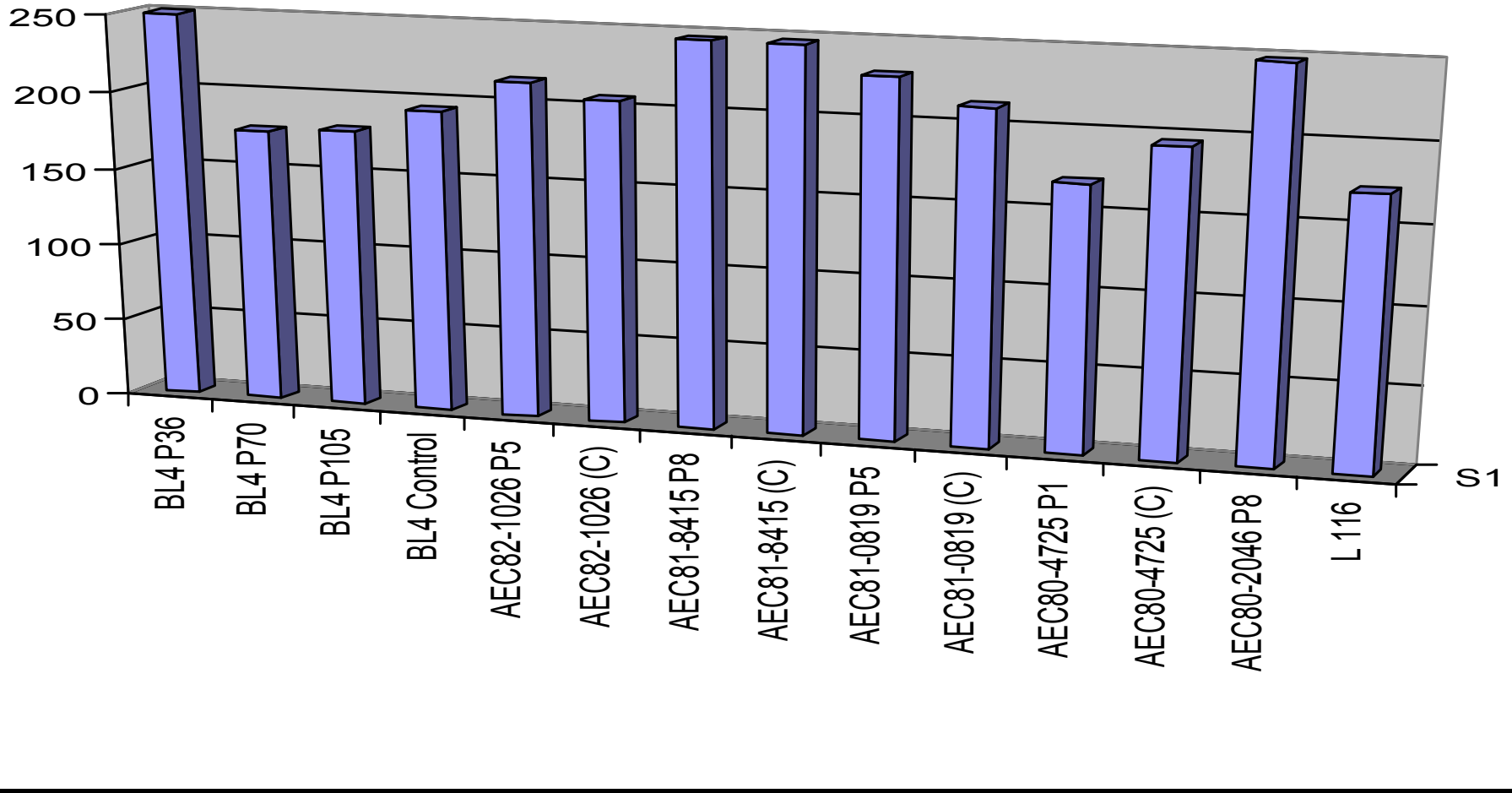
In vitro mutagenesis studies

Non-regenerable callus Type B

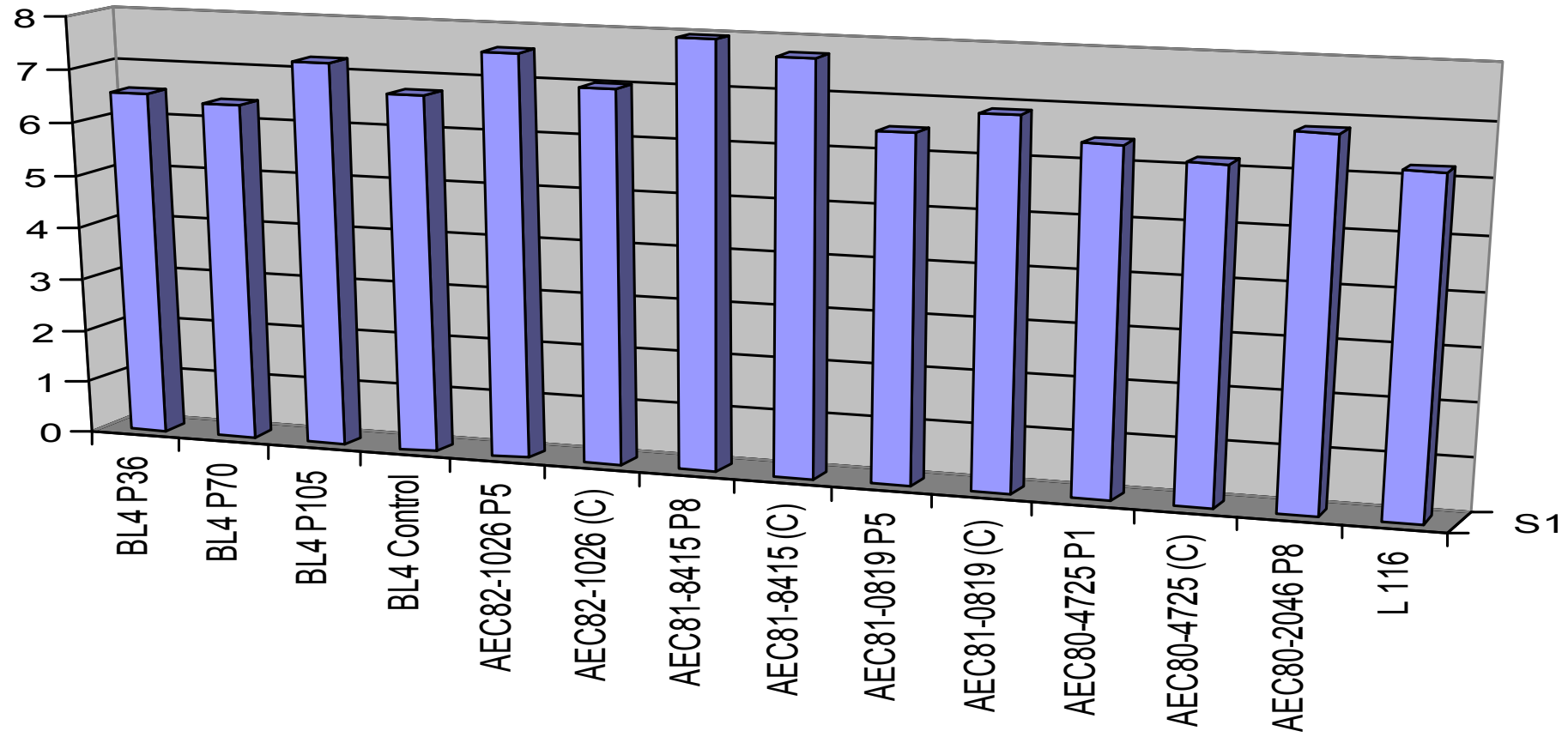
Cane girth (cm) of somaclones under study



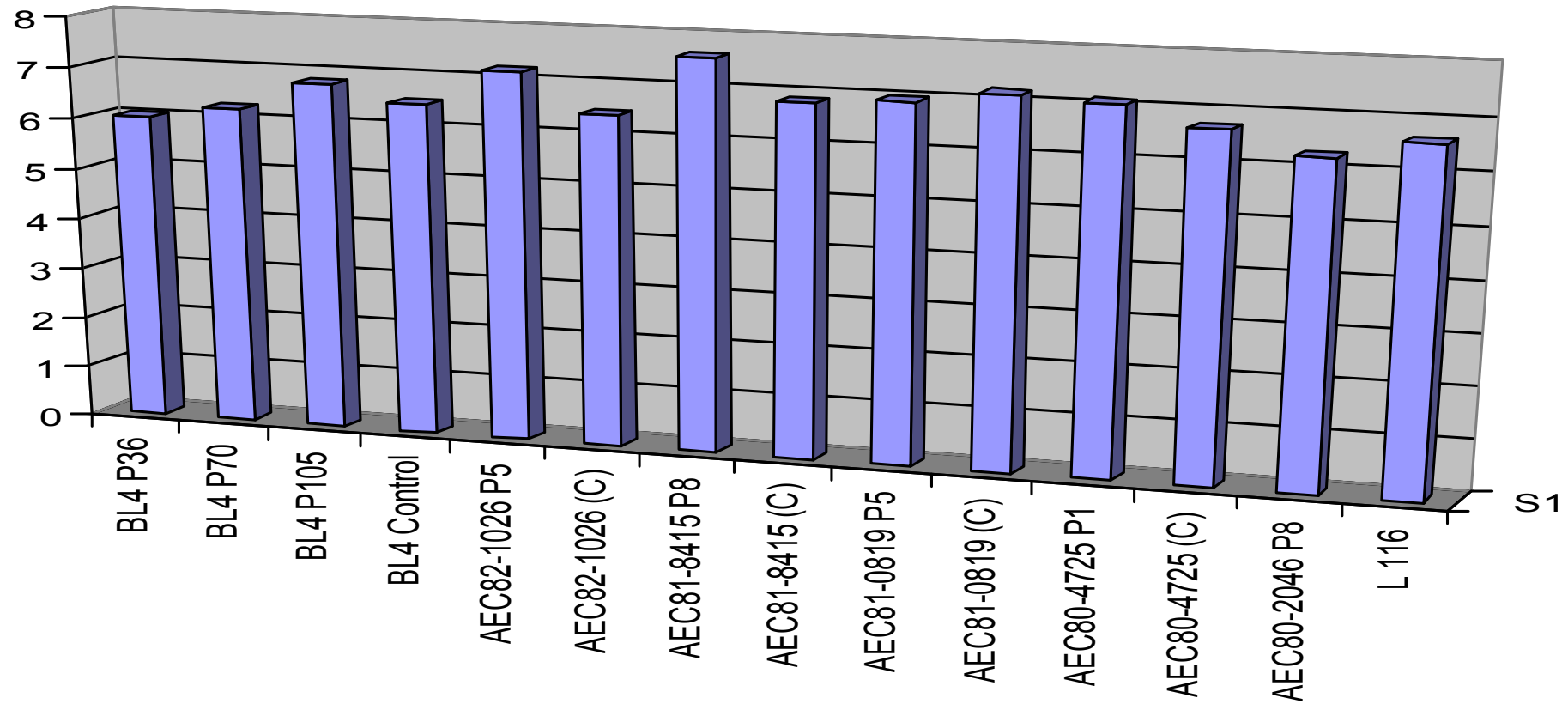
Cane length (cm) of somaclones under study



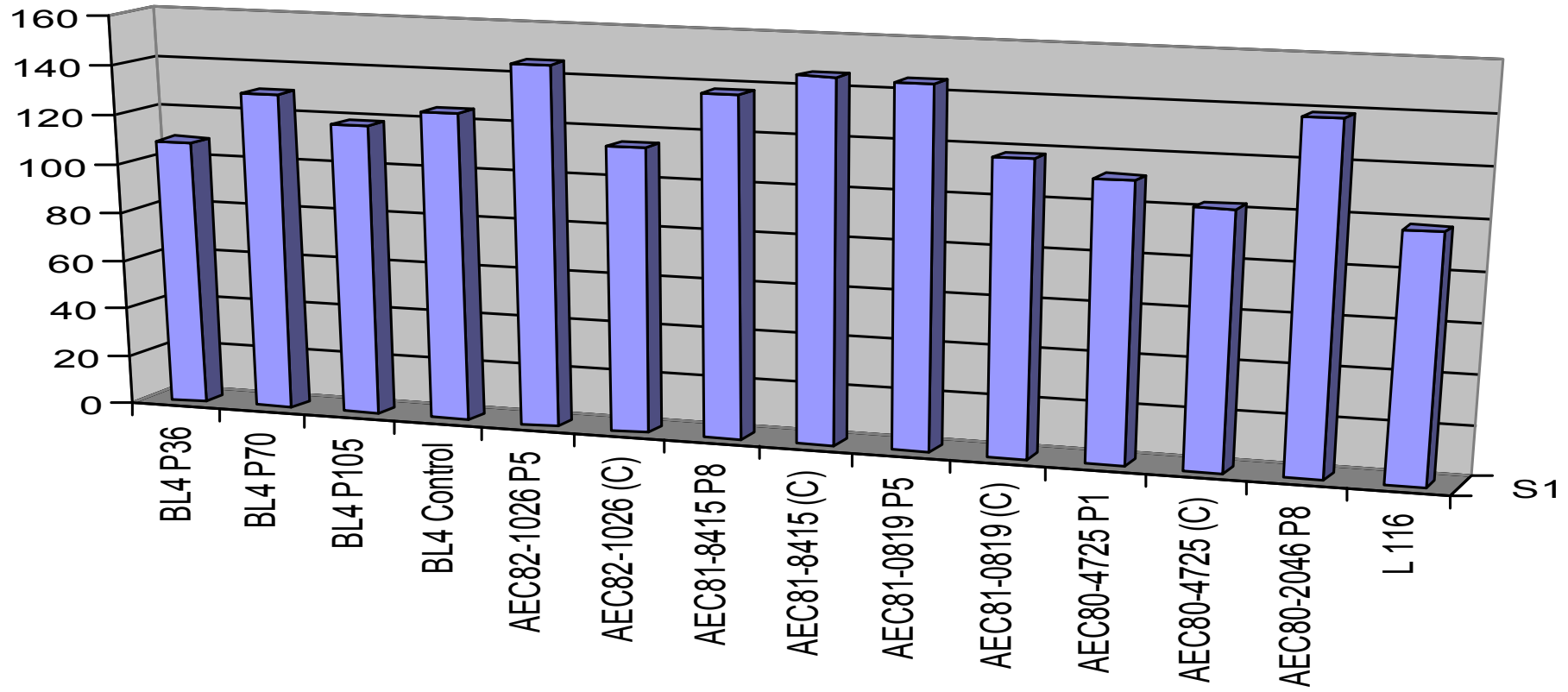
Cane weight/stool (kg) of soma clones under study



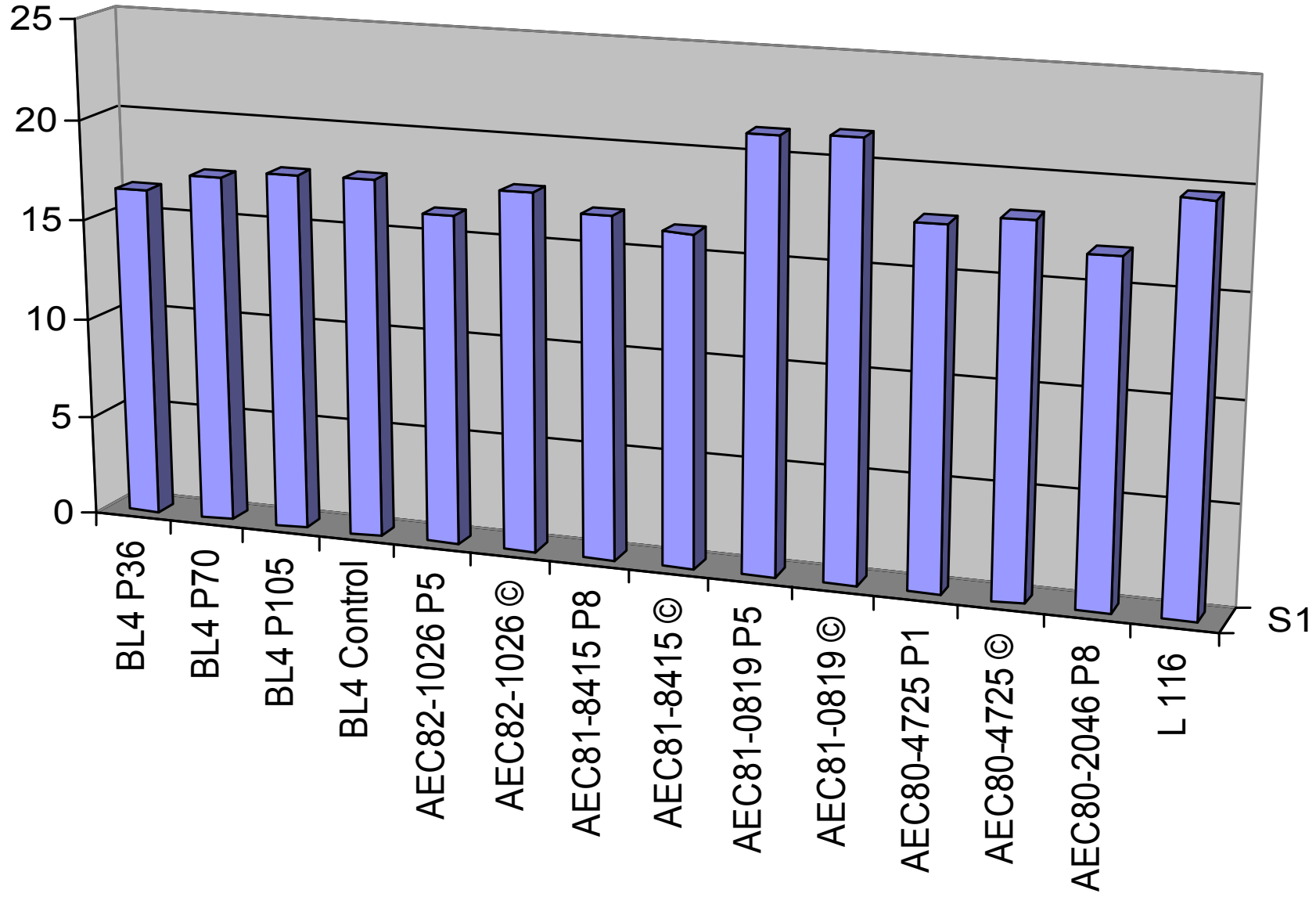
Tillers/plant (Nos) of somaclones under study



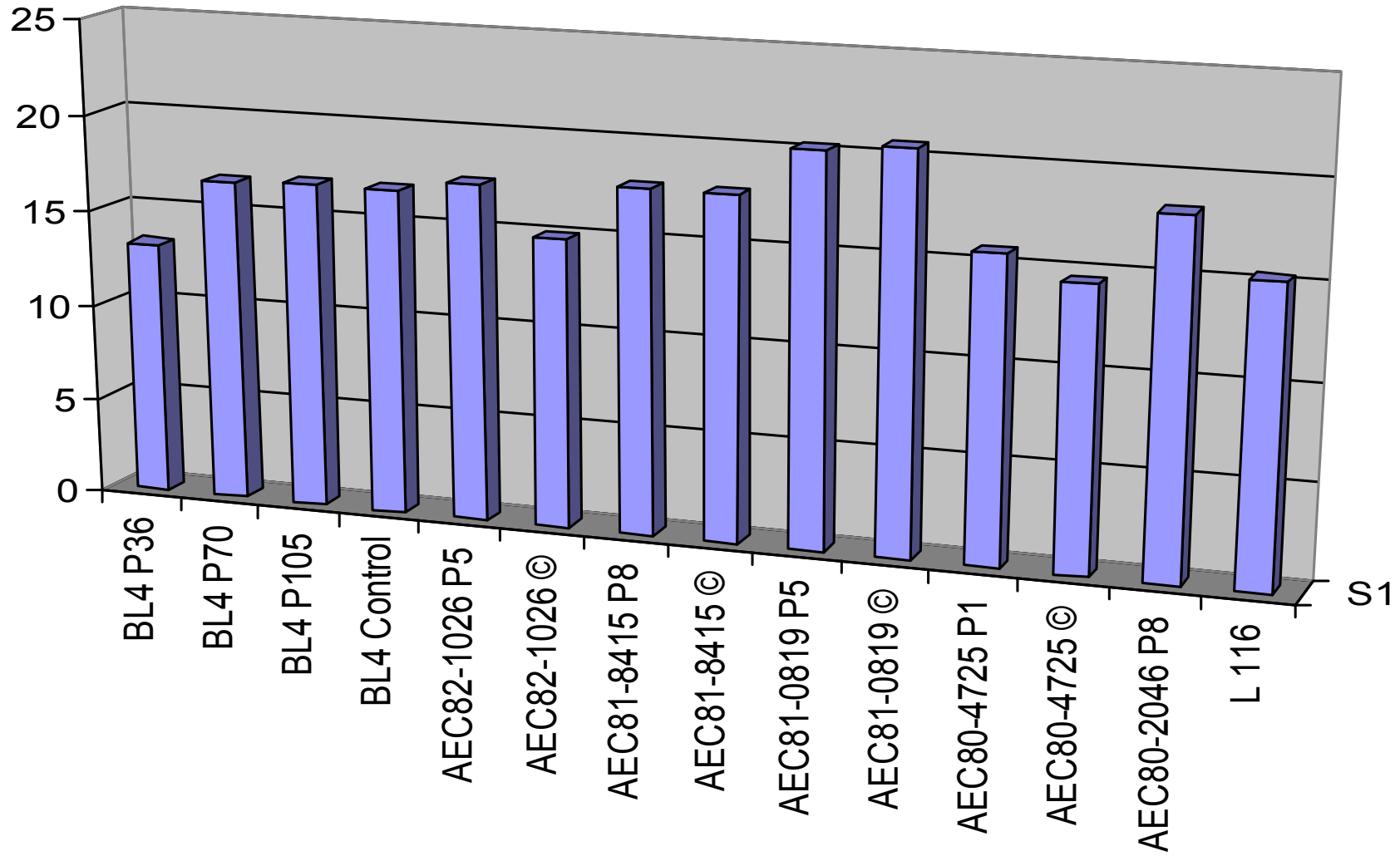
Cane yield (t/ha) of somaclones under study



Pol% of somaclones under study



Sugar yield (t/ha) of somaclones under study



Thanks for patience listening
Your Questions Please