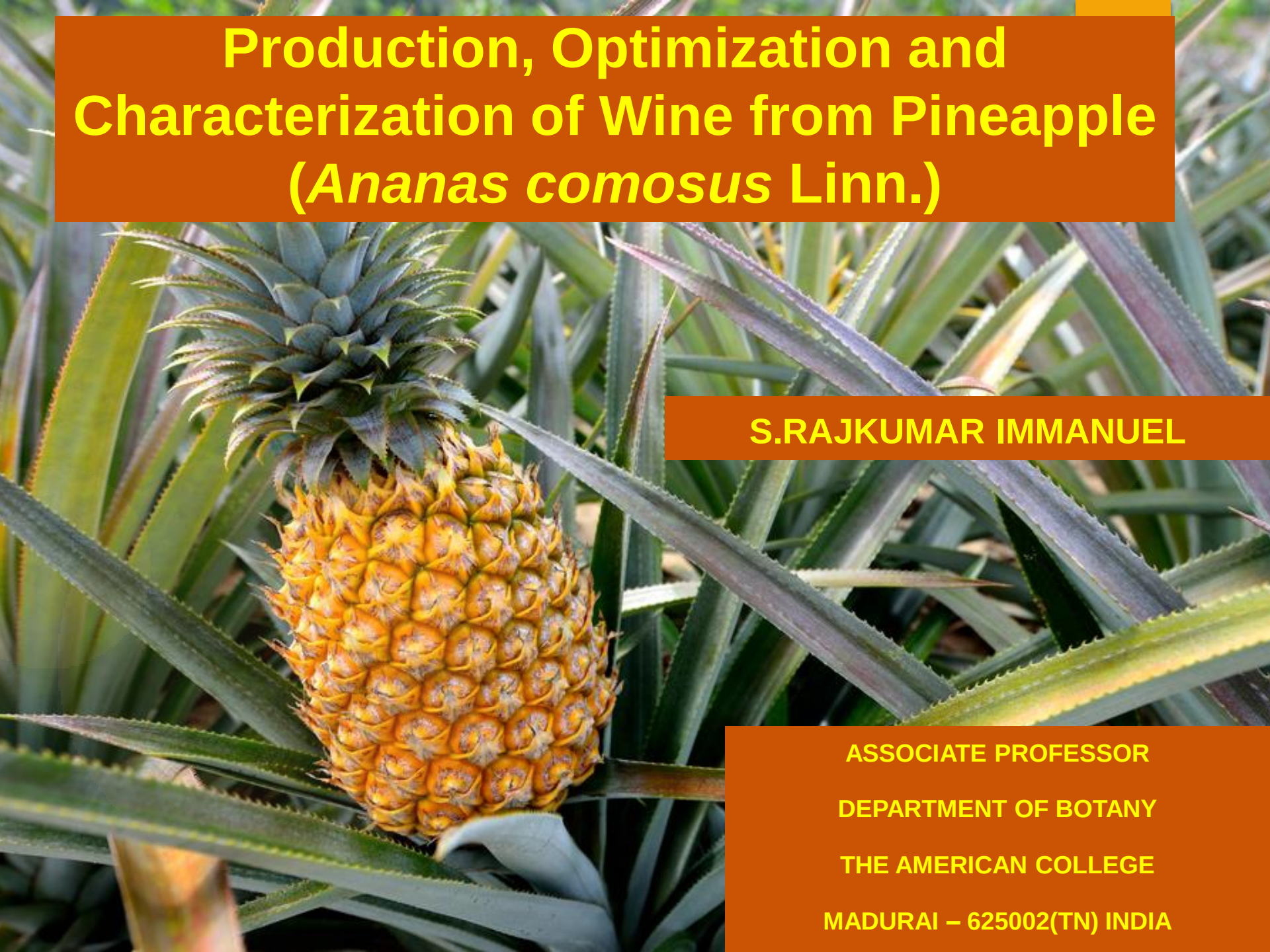
Production, Optimization and Characterization of Wine from Pineapple (*Ananas comosus* Linn.)



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WINE PRODUCTION STRATEGIES

THE WINE MAKING PROCESS:

can be divided into 4 basic phases

PHASE 1:

Finding a source of high quality ripened & right kind of fruits.

PHASE 2:

Consists of fermenting the fruits into wine.

PHASE 3:

During this phase , the new wine is clarified & stabilized.

PHASE 4:

Aging of the wine. Wine is smelled, tasted & measured every few weeks & any needed adjustment are made promptly.

SCOPE & OBJECTIVES

- Isolation of local yeasts from ripened fruits.
- To determine the efficiency of production of alcohol in the form of wine from pine apple juice using local yeast varieties.
- To determine the effect of dual yeast (*Saccharomyces cerevisiae* isolate I & II) culture on alcohol production from pine apple juice.
- To compare the performance of *Saccharomyces cerevisiae* isolate I & II & the dual culture in the production of alcohol during the fermentation process.

SELECTION CRITERIA FOR PINE APPLE FRUIT

- Pine apple fruit is rich source of sugar, protein, ascorbic acid phenols and minerals like Fe, Cu, Zn, Ca and K (Kulkarni *et al*., 2007).
- Post harvest diseases are the major constrains particularly in India and it ranges between 25-30% (Sudha *et al*., 2007).
- Many diseases greatly reduce the storage life, fruit contents and quality of pine apple
- Post harvest diseases of pine apple represent a very important source of wastage and mainly economic losses.

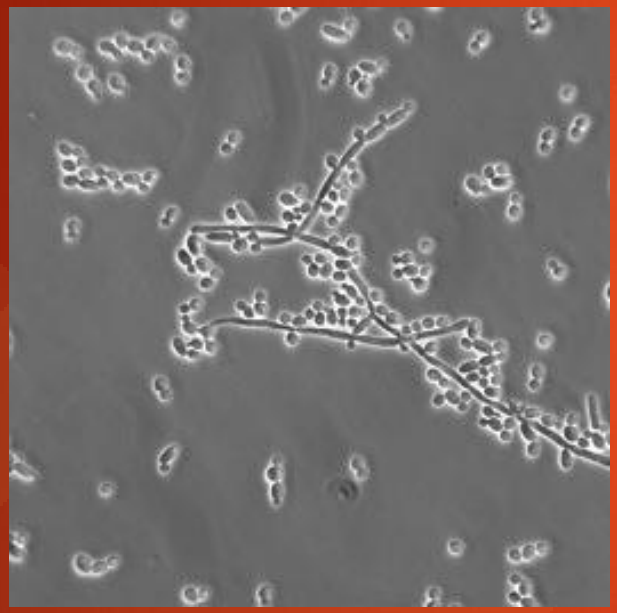
LOCATION OF EXPERIMENT

- The research work was carried in the bioprocessing & fermentation technology lab, The American College, Madurai, Tamilnadu, South India.

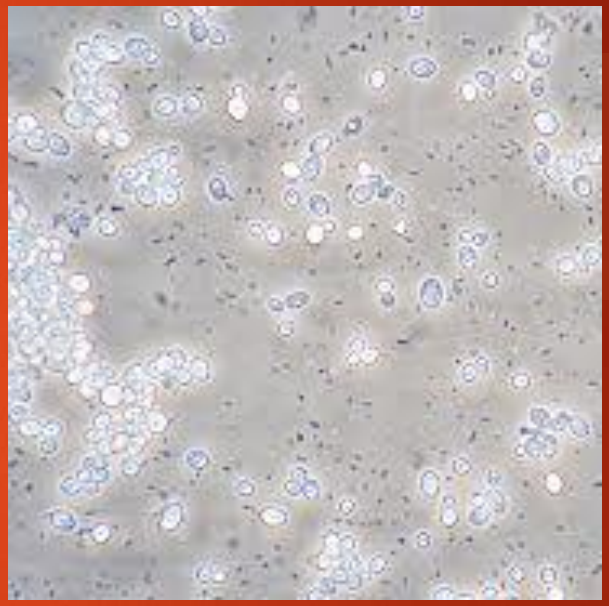
YEAST STRAINS & MEDIA

- Fruit sample of Sapota, Grape, Pineapple & Banana were collected from the local central market, Madurai.
- Yeast were isolated from pure samples of serial dilution method & inoculated on solids YEPDA medium & incubated at 28 – 30°C temperature.

MICROSCOPIC CHARACTERISTICS OF LOCAL YEASTS



Saccharomyces cerevisiae
ISOLATE I



Saccharomyces cerevisiae
ISOLATE II

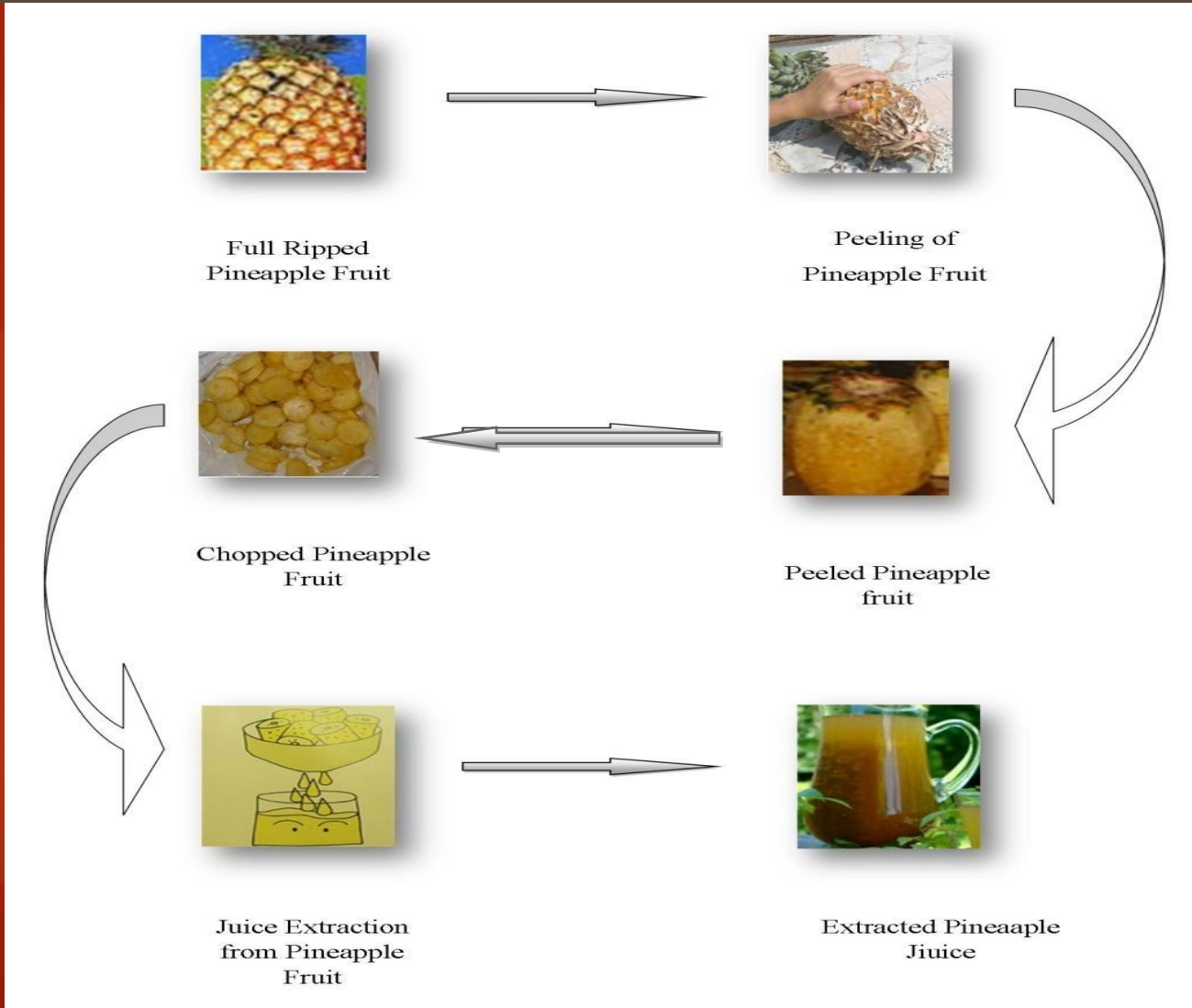
CELLULAR MORPHOLOGY

- Colonies of both *Saccharomyces cerevisiae* Isolates grew rapidly and matured in three days.
- Unicellular, globose and ellipsoid to elongate in shape.
- Pseudo hypahe are present and rudimentary in *Saccharomyces cerevisiae* Isolate I and it is absent in Isolate II.
- Although these two species differ in a number of ways, including their response to temperature , sugar transport and use they are closely related.

PRODUCTION OF PINE APPLE JUICE

- Pine apple (*Ananas comosus*) were obtained from the local central fruit market, Madurai.
- They were washed & surface sterilized using 1% $KMNO_4$ solution & were pressed using a juice mixer.

Fig 1. FLOW CHART OF PINE APPLE JUICE EXTRACTION



FERMENTATION OF PINE APPLE JUICE

- Six food grade fermentor were set up on one meter high bench, at 10 cm interval.
- 10 liter of the pasteurised pineapple juice was drawn into each of the rounded bottom fermentors.
- The fermentation was done in food grade plastic vessels place at 24±2.
- Yeasts were precultured for 24 hrs at room temperature. (28±2°C) before being used.
- Respective quantities of yeasts were measured & used to pitch the various units.

A FLOW DIAGRAM FOR THE PRODUCTION OF PINE APPLE WINE UNDER CONTROLLED FERMENTATION

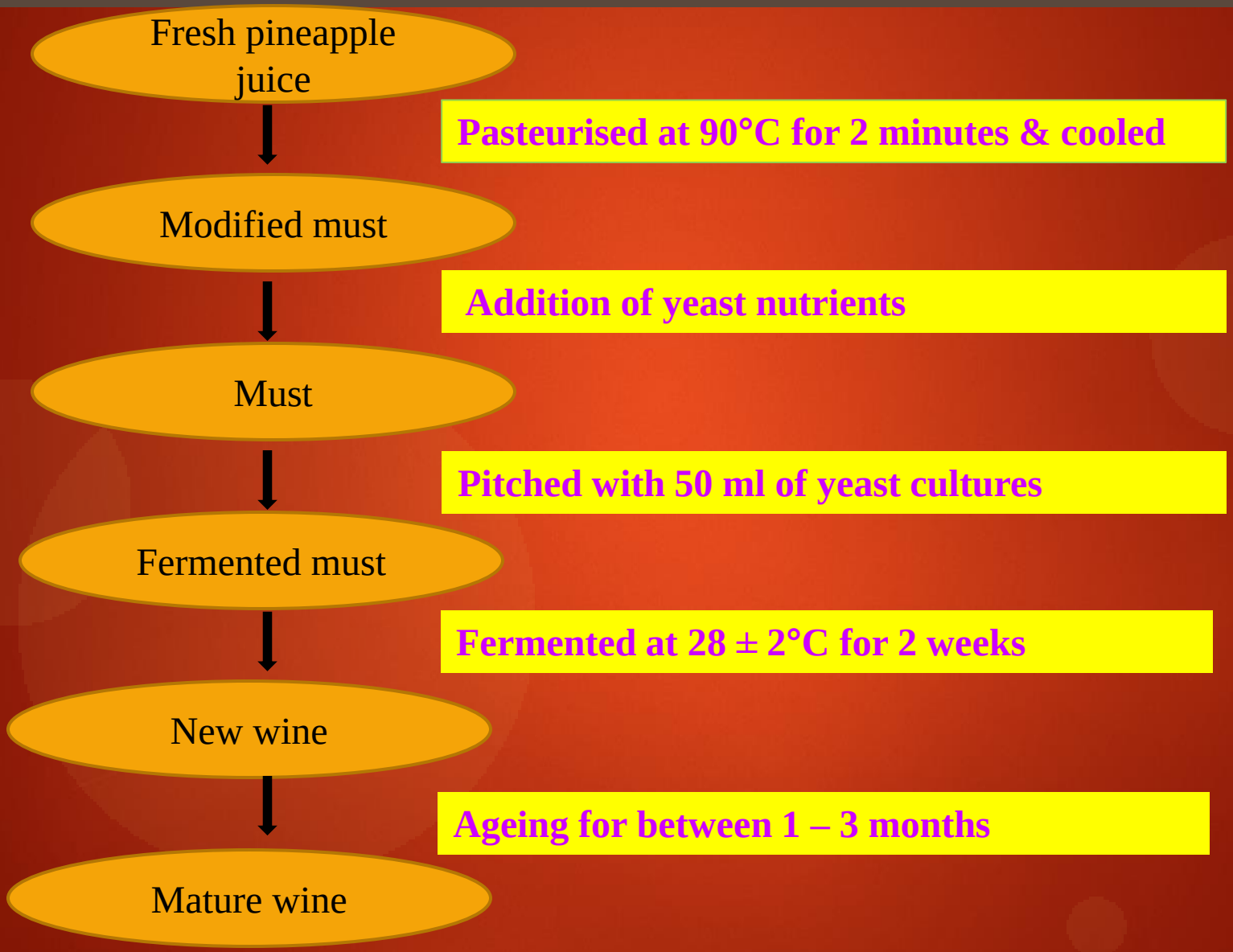


FIG 2. SECONDARY FERMENTATION



Experimental set-up

YEAST ISOLATES USED

- Two Local yeasts strains namely *Saccharomyces cerevisiae* I, II and Dual culture (*Saccharomyces cerevisiae* I & *Saccharomyces cerevisiae* II) were used.

- The concentration of yeast used was 50ml (5.0×10^{-6}cfu/g) and a control treatment (no yeast).

TREATMENTS USED

T1 – *Saccharomyces cerevisiae* isolate I @ 50ml (5.0×10^{-6} cfu/g)

T2 – control for *Saccharomyces cerevisiae* Isolate I

T3 – *Saccharomyces cerevisiae* Isolate II @50ml (5.0×10^{-6} cfu/g)

T4 – Control for *Saccharomyces cerevisiae* Isolate II

T5 – Dual culture (Isolate I & II) @50 ml (5.0×10^{-6} cfu/g)

T6 – Control for dual culture

PARAMETERS STUDIED

AMBIENT & MUST TEMPERATURE (°c)

Daily ambient & must temperatures were taken during the experimental period. Average daily ambient & must temperatures were recorded.

SUGAR CONTANT (°BRIX)

Fructose, Glucose, Sucrose & Total Sugar concentrations were obtained using brix refractometers & hydrometer. Readings were taken at 14^{th} day after fermentation.

ALCOHOLIC CONTANT

The alcoholic percentage levels (%/vol) in all the fermentor must were determined using alcohol meter & alcohol hydrometer. Readings were taken and alcohol levels (%/v) were calculated.

CHEMICAL ANALYSIS

pH OF THE MUST

The pH of the must was determined using a pH meter. The readings were taken on 14th day during fermentation.

ACID LEVELS

Titratable acid (TA) levels were determined by titration method (Il and, 2000:Elkasper 2007)

TABLE 1. BASIC CHEMICAL CHARACTERISTICS OF PINE APPLE JUICE

PRINCIPLE	NUTRIENT VALUE	% OF RDA
Energy	83 kcal	4%
Carbohydrates	19.9 g	15%
Protein	0.44 g	<1%
Total fat	1.10 g	3.5%
Cholesterol	0 mg	0%
Dietary fiber	5.3 g	17%
VITAMINS		
Folates	15 мg	3.5%
Niacin	0.200 mg	1%
Panthothenic acid	0.252 mg	5%
Pyridoxine	0.037 mg	3%

PRINCIPLE	NUTRIENT VALUE	% OF RDA
Thiamin	0.058 mg	5%
Vitamin A	60 IU	2%
ELECTROLYTES		
Sodium	12 mg	1%
Potassium	193 mg	4%
MINERALS		
Calcium	21 mg	2%
Copper	0.086 mg	9%
Iron	0.80 mg	10%
Magnesium	12 mg	3%
Phosphorous	12 mg	2%
Selenium	0.6 µg	1%
Zinc	0.10 mg	1%

TABLE 2. BASIC CHEMICAL CHARECTERISTICS OF FRESHLY CRUSHED PINEAPPLE JUICE

CHEMICAL CHARACTERISTICS	VALUE ± SD
pH	3.9 ± 0.0
Total soluble solid (TSS, ˚Brix)	18.1 ± 0.1
Total titratable acidity (TTA as citric acid) (% W/V)	0.67 ± 0.01
Nitrogen content (%W/V)	0.08 ± 0.01

TABLE 3. CHEMICAL ANALYSIS OF FINAL PINE APPLE JUICE FERMENTED BY SINGLE & DUAL CULTURES

YEAST SPECIES	pH	TSS (˚ BRIX)	TTA (As citric acid/% w/v)	% alcohol (V/V)	Sugars Glucose	(g 100 Fructose	Ml ¯1) Sucrose
S. c isolate I	3.7	8.4	0.67	13.0	0.00	0.81	0.41
S. c isolate II	3.5	11.6	0.75	16.1	0.92	5.67	0.13
S. c –I&II	3.6	6.6	0.77	18.1	0.64	0.45	0.00

FIG 3. CHEMICAL ANALYSIS OF FINAL PINE APPLE JUICE FERMENTED BY SINGLE AND DUAL CULTURES

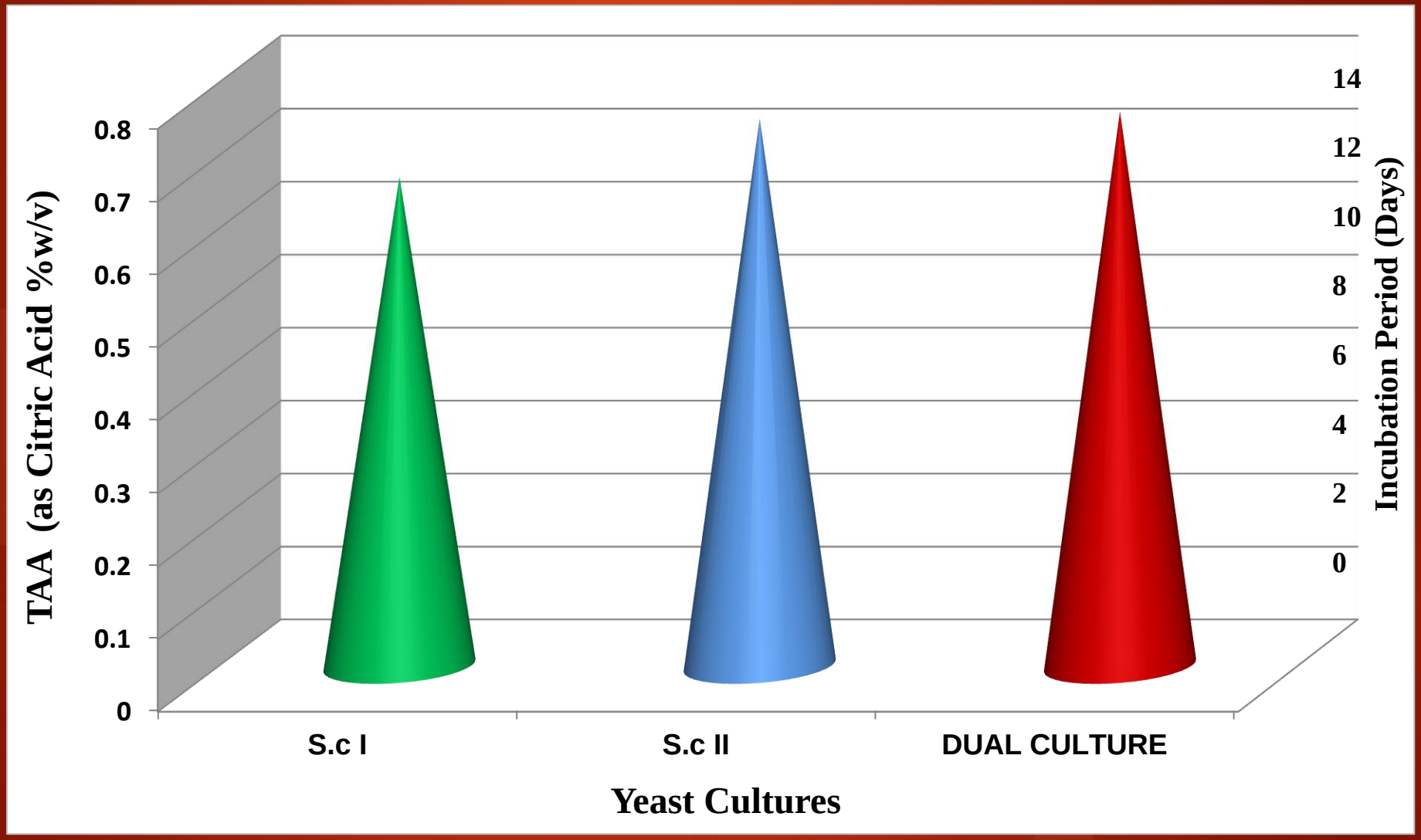


FIG 3. AMBIENT AND MUST TEMPERATURE

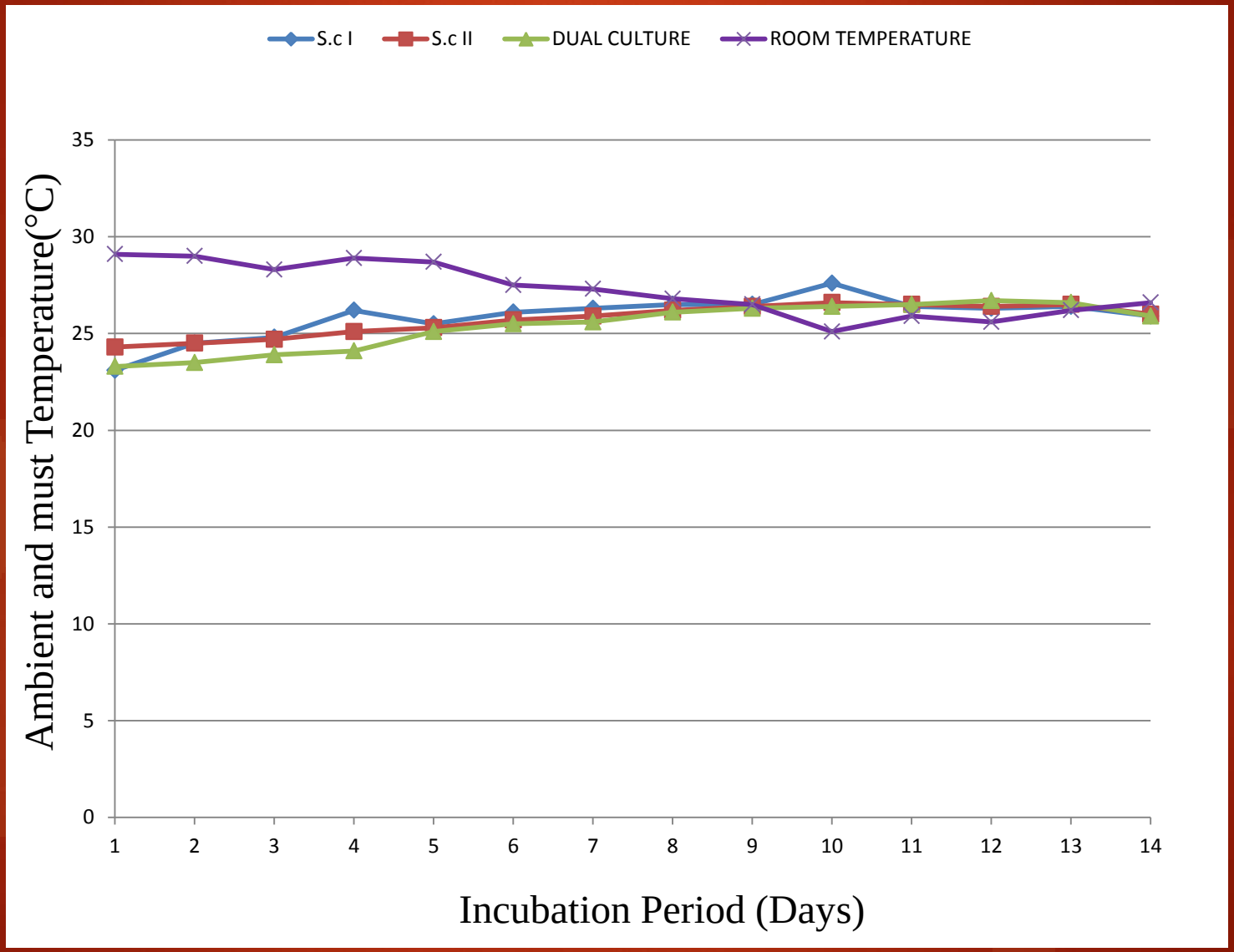


TABLE 4. DETERMINATION OF pH

DAYS	*Saccharomyces cerevisiae – I*	*Saccharomyces cerevisiae – II*	DUAL CULTURE
0	4.0	3.8	3.9
2	3.9	3.8	3.9
4	3.7	3.8	3.7
6	3.7	3.7	3.5
8	3.7	3.6	3.5
10	3.7	3.6	3.4
12	3.7	3.5	3.4
14	3.6	3.6	3.5

FIG 4. EFFECT OF YEAST ON pH OF PINE APPLE MUST

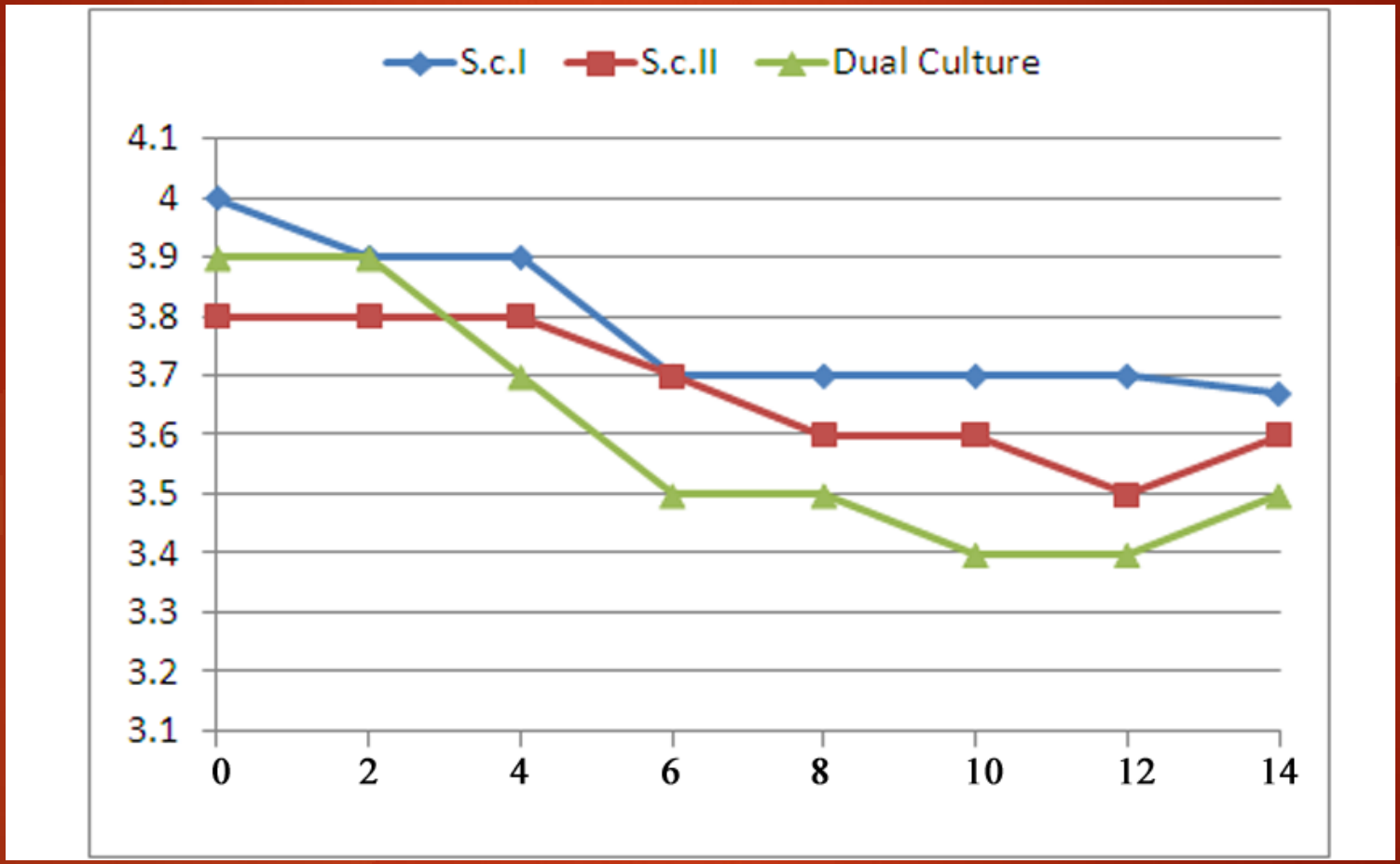


TABLE 5. ANALYSIS OF TSS (°Brix)

DAYS	*Saccharomyces cerevisiae – I*	*Saccharomyces cerevisiae – II*	DUAL CULTURE
0	19.4	21.3	24.3
2	17.8	19.6	21.1
4	14.5	16.3	18.4
6	12.1	10.4	14.3
8	9.2	8.7	12.9
10	8.1	7.4	9.5
12	7.8	6.2	7.6
14	7.1	5.7	4.3

FIG 5. EFFECT OF YEAST ON TSS OF PINE APPLE MUST

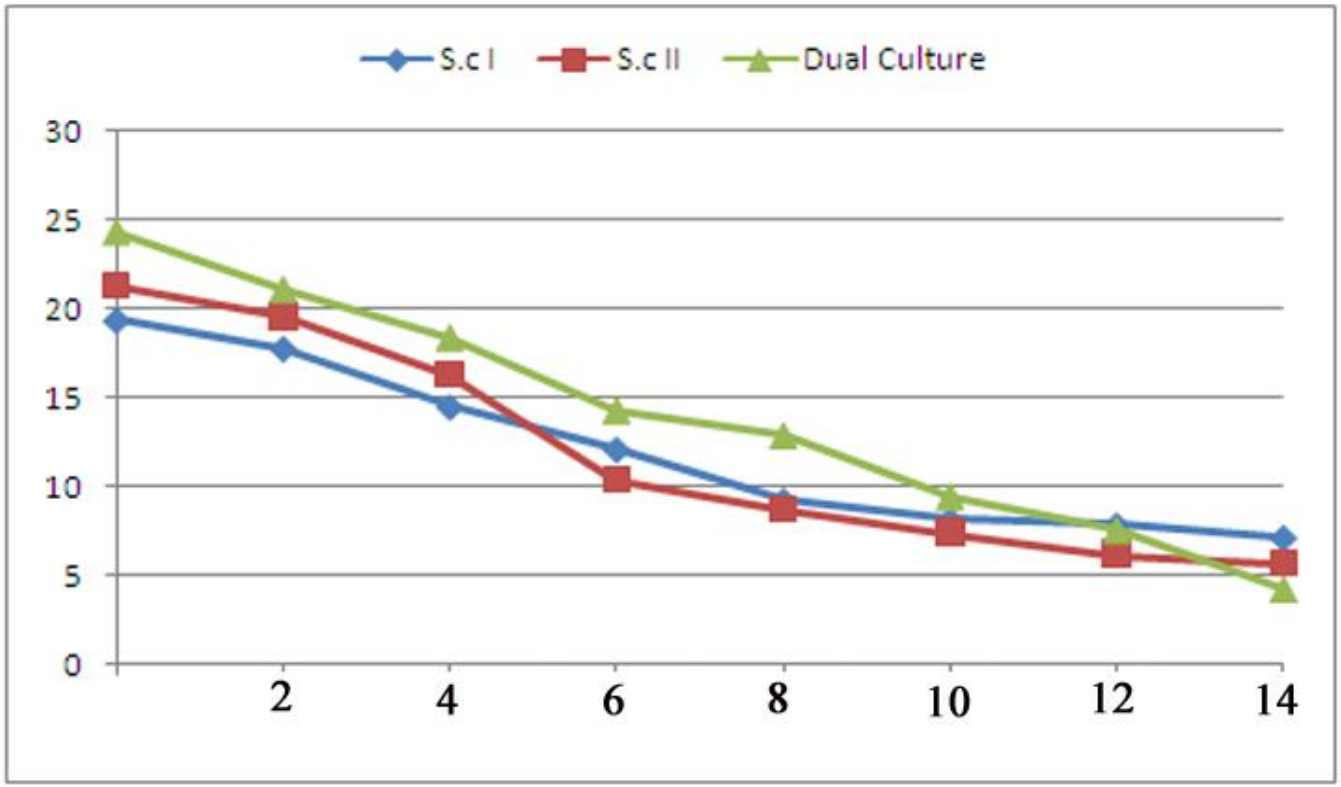


TABLE 6. EFFECT OF *SACCHAROMYCES CEREVISIAE* ISOLATE – I OF PINE APPLE MUST

SPECIFIC GRAVITY(SG)	BRIX (SG – 1)×220)+1.6	POTENCIAL ALCOHOL
1.025	7.1	3.3
1.035	9.3	4.6
1.040	10.4	5.2
1.060	14.8	7.9
1.075	18.1	9.9
1.090	21.4	11.8
1.100	23.6	13.0

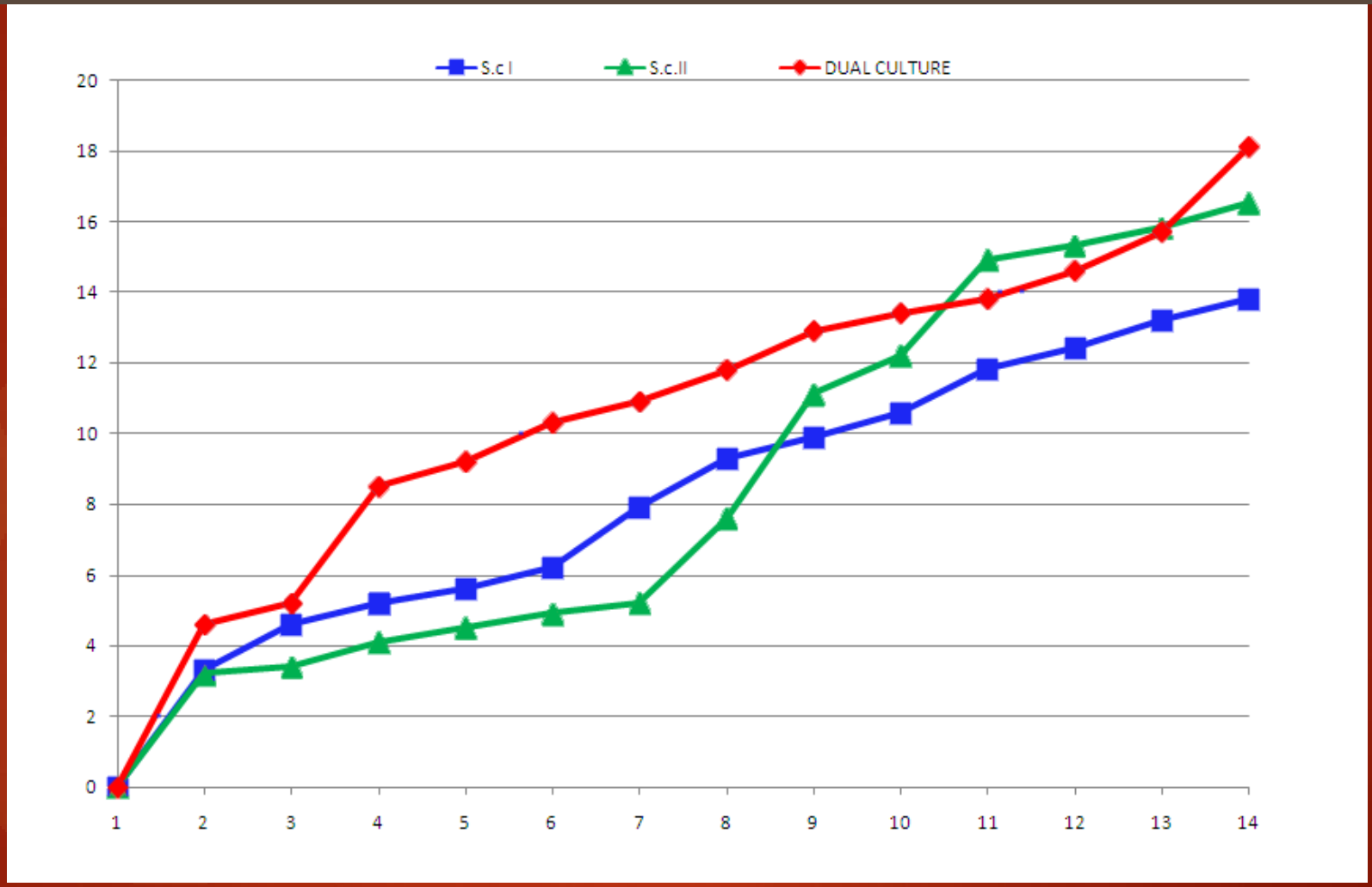
TABLE 7. SACCHAROMYCES CEREVISIAE ISOLATE II

SPECIFIC GRAVITY	BRIX (SG – 1)×220)+1.6	POTENTIAL ALCOHOL
1.030	8.2	3.2
1.040	10.4	4.5
1.045	11.5	5.2
1.085	20.3	11.1
1.110	25.8	14.9
1.120	28.0	15.9
1.130	28.2	16.2

TABLE 8. EFFECT OF YEAST DUAL CULTURE ON ALCOHOL CONTENT OF PINE APPLE MUST

SPECIFIC GRAVITY(SG)	BRIX (SG – 1)×220)+1.6	POTENCIAL ALCOHOL
1.045	11.5	5.2
1.065	19.9	8.5
1.080	19.2	9.2
1.070	17.0	10.3
1.100	23.6	13.4
1.115	26.9	15.7
1.130	30.2	18.1

FIG 6. EFFECT OF YEAST ON ALCOHOL CONTENT OF PINE APPLE MUST



CONCLUSION

- On the Basis of the results from the preliminary studies conducted to evaluate the locally identified yeast strains, it may be concluded that these strains were found to be equally good in terms of the quality parameters.
- In some cases these strains were found to be better than commercially available yeast preparation.
- It is evident from the present study that these isolates are a very good source for the production of bulk amounts of wine which convert sugars into alcohol.
- However, further studies on commercially important yeast strains are needed to confirm the results and to confirm the exploitation of locally identified strains on the commercial level.

