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New Product Development from Food Processing Industry Waste

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***Abstract* - Utilization of food industry waste is very important. Food waste was one of the problems faced by the industries. Handling and disposal of the food waste was very difficult for industries. In this research we focused one of the food processing industries waste. The present study was carried on tomato waste. Tomato puree was prepared from tomato waste. The puree was analyzed for chemical and microbial quality during storage studies. Puree was analyzed for acidity, pH, non-enzymatic browning, lycopene content, and total polyphenols content and microbial growth. The puree was rich in lycopene content. Hence tomato waste can be useful for preparation of tomato based products like tomato ketchup etc.**

Keywords- Tomato waste, Tomato Puree, Lycopene, Total Polyphenols

I. INTRODUCTION

Food waste was one of the problems faced by the industries. Handling and disposal of the food waste was very difficult for industries. In this research we focused one of the food processing industries waste. The main objective of the study is maximum usage of food industry waste by converting into value added products. In present study we choose tomato waste. From this waste tomato puree was prepared. Now a day's tons of tomatoes were simply discarded because of lack of proper storage facilities. One of the methods to reduce the tomato waste is preparation of tomato concentrate. By converting the tomatoes into products can be preserved without any detoriation. Concentrated form of tomatoes can be useful in lean season.

II. METHOD

A. Tomato puree preparation

Collection of Tomato waste

⬇

Grinding

⬇

Heating of paste at 80-90°c until total solids reached to 15°B

⬇

Add 4g salt and 0.3g sodium benzoate

⬇

Hot filling in sterile glass bottle

⬇

Sealing

⬇

Storage at room temperature

Fig.1 Tomato pulp

Fig.2 Tomato puree

Figure 1 shows tomato pulp collected from industry and figure 2 shows puree made from the tomato pulp.

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III. QUALITY ANALYSIS

The puree analyzed for Lycopene, total polyphenols, non-enzymatic browning, acidity, p^H and microbial quality for 6months.

A. Acidity

Acidity of puree was determined as per standard methods of Ranganna S. (1986).

2 g of sample was taken in clean, dry conical flask. Sample was diluted with distilled water. Then sample was titrated against 0.1N of NaoH until faint pink color was appeared. This is the end point. Note down the volume of NaoH taken for titration and calculate acidity of puree as given bellow.

%Acidity (citric acid) =64*Normality of NaoH * Volume of NaoH*100/1000*weight of sample

B. pH and TSS

pH of puree was checked by electronic pH meter. Total soluble solids of puree was measured with refractometer.

C. Non enzymatic browning

NEB was determined as per standard methods of Ranganna S. (1986).

Puree sample (1g) was extracted with alcohol (50ml) on magnetic stirrer. After extraction extract was filtered and optical density (OD) of sample taken at 440nm using spectrophotometer.

D. Lycopene

Lycopene content was determined as per standard methods of Ranganna S. (1986)

1. Weigh 5-10g of juice, puree.
2. Extract repeatedly with acetone in pestle and mortar or blender until the residue is colorless.
3. Transfer the acetone extract to a separating funnel containing 10 15 ml of petroleum ether and mix gently.
4. Take up the carotenoid pigments into the petroleum ether and mix gently.
5. Take up the carotenoid pigments into the petroleum ether by diluting the acetone (Lower Phase) with water or water containing 5% sodium sulphate.
6. Transfer the lower phase to another separating funnel and petroleum ether extract containing carotenoid pigments to an amber color bottle.
7. Repeat extraction of the acetone phase similarly with petroleum ether until it is colorless.
8. Discard the acetone phase.
9. To the petroleum ether extract, add small quantity of anhydrous sodium sulphate, transfer to a 50 ml volumetric flask and dilute to mark with petroleum ether.
10. Dilute an aliquot (5ml) to 50ml with petroleum ether and measure the color in a spectrophotometer using petroleum ether as blank.

Calculate lycopene content of the sample as given bellow using the relationship that on OD of 1.0=3.1206 ug of lycopene/ml

Molar equilibrium coefficient of lycopene = $17.2* 10^4$

Molecular weight of lycopene = 536.85

Mg of lycopene/100g = (3.1206 * OD * volume made up * Dilution * 100)/ $17.2*10^{4*}$ weight of sample * 1000

E. Polyphenols

Phenols the aromatic compounds with hydroxyls group are widespread in plant kingdom. They occur in all parts of the plants. Phenols are said to offer resistance to diseases and pests in plants. Grains containing high amount of polyphenols are resistant to bird attack. Phenols include an array of compounds like tannins, flavonols etc. total phenol estimation can be carried out with the Folin-Ciocalteau reagent (Malick, C P and Singh, M B (1980))

Principle

Phenols react with phosphomolybdic acid in Folin-Ciocalteau reagent in alkaline medium and produce blue colored complex (molybdenum blue).

Materials

80% ethanol

Folin-Ciocalteau reagent

Sodium carbonate (Na_2Co_3)-20%

Standard (100mg Catechol in 100 ml water)- Dilute 10 times for working standard.

Procedure

1. Weigh exactly 0.5 to 1 g of the sample and grind it with a pestle and motor in 10 time volume of 80%ethnol
2. Centrifuge the homogenate at 10000rpm for 20min. save the supernatant. Re-extract the residue with five times the volume of 80%ethnol, centrifuge and pool the supernatant.
3. Evaporate the supernatant to dryness.
4. Dissolve the residue in known volume of distilled water (5ml).
5. Pipette out different aliquots (0.2 to 2ml) into test tubes.
6. Make up the volume in each tube with 3ml with water.
7. Add 0.5ml of Folin-Ciocalteau reagent.
8. After 3min, add 2ml of 20% sodium carbonate solution to each tubes.
9. Mix thoroughly. Then place the tube in a boiling water for exactly 1 min, cool and measure and measure the absorbance at 650nm against a reagent blank.
10. Prepare a standard curve using different concentrations of catechol.

CALCULATIONS

From the standard curve find out the concentration of phenols in the test sample and express as mg phenols/100g material.

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F. Optical properties (Color Measurement)

The colour (L^*, a^*, b^*) values of products were measured with a Hunter Lab UltraScan VIS (Hunter Associates Laboratory, Reston, Va., U.S.A.). Triplicate samples were subjected to colour measurement and means were taken for respective products. The color values were indicated by L*, a*, b*. L* indicate brightness/whiteness, positive a* indicates redness, negative a* indicates yellowness, positive b* indicates greenness and negative b* indicates blueness of product.

G. Aerobic Mesophilic Plate count

10 g of sample was mixed with 90 ml of saline and homogenised well. 1 ml of the homogenized sample was added into test tubes containing 9 ml of saline and serial dilution was done. After dilution, pour plating and 48 h of incubation period at 36°C (Frances & Keith, 2001). Following incubation, all the colonies on the dishes containing 25 - 250 colonies were counted and recorded per dilution. The number of colonies on the plate was expressed as < 25 for those colonies less than 25 and > 250 for those exceeding than 250 and too numerous to count (TNTC) if numerous number of bacterial count obtained. For plates with 25 - 250 colonies forming units (CFU) of aerobic plate count (APC) or total plate count (TPC) was calculated as follows:

$$N = \frac{\sum C}{[(1 * n_1) + (0.1 * n_2)] * d}$$

Where

N - Number of colonies per ml or g of product

$\sum C$ - Sum of all colonies on all plates counted

n_1 - number of plates in the first dilution counted

n_2 - number of plates in the second dilution counted

d - Dilution from which the first counts were obtained

H. Yeasts and Molds

The type of media for growth of yeasts and molds was potato dextrose agar (PDA). 10 g of the sample was mixed with 90 ml of saline and homogenised well. 1 ml of the homogenized sample was added into test tubes containing 9 ml of saline and serial dilution was done. After dilution, pour plating and 5 days of incubation period at 28°C (Frances & Keith, 2001). The colonies were counted and multiplied by the inverse of the corresponding dilution and reported as yeast or mold count per g or ml.

IV. RESULTS & DISCUSSION

TABLE 1 Tomato puree-Shelf life study

Month	Acidity, % CA	pH	TSS	NEB	Polyphenols, mg/100g	Lycopene, mg/100g	L*	a*	b*	Microbial growth
Zeroth	1.45	4.01	15	0.281	115.37	15.43	40.53	20.21	20.57	no growth
3rd	1.4	4.1	15	0.381	114.657	11.5241	40,19	22.57	19.78	no growth
6th	1.4	4.1	15	0.956	16.4313	9.788	39.46	22.3	20.24	no growth

Above table shows quality of tomato puree at room temperature during storage period. Puree was preserved up to six months. Initially puree was rich in Lycopene content, Lycopene was light sensitive, and its content was decreased in puree during storage period.

V.CONCLUSIONS

- Puree made from industry waste is resembled to market sample.
- During storage period three is not much variation observed in acidity and pH of puree.
- There is no change in total soluble solids in puree. Non enzymatic browning of sample was noticed (OD 0.28 to 0.95).
- During storage there was huge reduction in polyphenols content i.e. from 115.37 to 16.4313mg/100g was observed.
- Lycopene content was decreased during storage from 15.43 to 9.788 mg/100g. Lycopene was decreased because is light sensitive pigment.
- Puree was stored up to 6months without any microbial growth.
- Hence concluded that tomato waste was suitable for production of tomato based products.

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