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Formulation and quality evaluation of tomato pickle prepared from tomato paste

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Abstract
Tomato is one of the most popular and widely cultivated vegetables. It is a good source of fibre, lycopene, beta carotenes and vitamin C adds variety of colour and flavouring compounds. In the present research efforts were been made to formulate the process for preparation of value added product that is tomato pickle. Two treatments were been made one is with the addition of jaggary and another one is without of jaggary. Furthermore the prepared and sensorial screened product assessed for nutritive value. From the sensorial evaluation it was evident that T_1 formulation found optimum as per hedonic rating test. From the nutritional profile of pickle it was revealed that tomato pickle is rich in carbohydrate followed by protein, fat and total mineral i.e. ash. Furthermore, investigation reveals the, tomato pickle could be shelf stable up to 20 days.

Keywords: tomato pickle, tomato paste, sensory evaluation, storage stability

1. Introduction
Tomato (*Lycopersicon esculantum L.*) belongs to the family of Solanaceae, and is an economically important fruit crop widely grown in India. A wide variety of tomato products *viz*., juice, powder, puree, sauce, soup and traditionally chutneys, curries and pickles are prepared in India. India ranked fourth in tomato production with 10.26 MMT out of the total world production of 129 MMT in 2008-09 (Anonymous, 2008) [3] Literature on composition of tomato and its processing into value added products was reported extensively. Tomatoes are a rich source of lycopene (60-90 mg/kg), vitamin C (160-240 mg/kg), polyphenols (10-50 mg/kg) and small quantities of vitamin E (5-20 mg/kg) (Charanjeet *et al.,* 2004) [4]. Lycopene content in tomato (Garcia and Barrett, 2006) and antioxidant activity of fresh and processed tomato samples (Giovanelli *et al.*, 2004) [6] were reported. A series of quantitative and qualitative changes of the chemical composition take place during tomato fruit ripening. Organic acids, soluble sugars, amino acids, pigments and over 400 aroma compounds contribute to the taste, flavour and aroma volatile profiles of the tomatoes (Petro Turza, 1987) [7]. The ripening of tomatoes is characterised by the softening of the fruit, the degradation of chlorophylls and an increase in the respiration rate, ethylene production, as well as the synthesis of acids, sugars and lycopene (Cano, Acosta and Arnao, 2003) [5]. Tomatoes contain higher levels of fructose and glucose than sucrose (Garvey and Hewitt, 1991 [8]; Miron and Schaffer, 1991) [9]. In view of the various facts and figures regarding the tomato processing, tomato perishability it is very feasible to formulate valuable product from tomato. Tomato is perishable fruit vegetable once it harvested respirational activities of tomato leads to senescence and thus leads to wastage. To avoid the wastage of tomato present work was programmed with the standardization and formulation of value added food product from tomatoes.

2. Materials and Methods
Present project work entitled with formulation and development of tomato pickle was carried out in the department of food process technology, Shivramji Pawar College of Food Technology, Nehrunagar, Kandahar during the academic year of 2019 to 2020.

2.1 Raw Materials
All the raw materials required (Tomatoes and Various spice mix) for the processing of pickle was purchased from local market of Kandhar, Nanded.

2.2 Nutritional profile of tomato pickle
2.2.1 Determination of moisture content
About 2 g of the sample was weighed and placed in a crucible of constant weight. This was placed in an oven at 105^0C then dried; the weight was measured carefully to get a constant weight. The loss in weight indicates the moisture content (AOAC, 2005) [1]. The moisture content was calculated by,

$$\text{Moisture (\%)} = \frac{\text{Initial weight} - \text{final weight}}{\text{Total weight of sample}} \times 100$$

2.2.2 Determination of ash content
Crucible used for ash content determination was weighed and dried in a hot air oven at 110^0C to a constant weight. About 2 g of sample was weighed and placed in the crucible and weight of the crucible was taken. This was placed in a furnace and ignited for 3 h at 250-300^0C. The temperature was again raised to 550^0C. The weight of crucible with its ash content was recorded and the ash content was calculated and expressed as percentage of original sample (AOAC, 2005) [1].

$$\text{Total Ash (\%)} = \frac{\text{Weight of crucible with ash} - \text{Weight of empty crucible}}{\text{Wight of sample (g)}} \times 100$$

2.2.3 Determination of crude protein content

The crude protein was determined by the Micro Kjeldhal's Method as described in method no. 46-10 of (AACC, 2000) [2]. This is based on the fact that on digestion with concentrated sulphuric acid and catalysts, organic compounds are oxidized and the nitrogen is converted to ammonium sulphate. Upon making the reaction mixture alkaline, ammonia is liberated, removed by the steam distillation, collected and titrated.

2.2.4 Procedure

The nitrogen content of samples was determined by using micro Kjeldhal's method. The sample was first digested in digestion flask with H_2SO_4 in presence of digestion mixture for 3-4 hours till the contents of digestion flask get transparent colour. The samples were then diluted with distilled water up to 250 ml in a volumetric flask. The ammonia from the samples was liberated through distillation after adding 40% NaOH solution and collected in flask containing 4% boric acid solution using methyl red as an indicator. The nitrogen content in the samples was determined by titrating against standard 0.1 N H_2SO_4 solution and the crude protein percentage was calculated by using following formula,

$$\% N = \frac{(\text{Sample-Blank}) \times N \text{ of } H_2SO_4 \times 0.014 \times \text{Dilution Factor}}{\text{Aliquot taken} \times \text{Weight of sample (g)}} \times 100$$

Total Crude Protein = % Nitrogen x 6.25

2.2.5 Determination of crude fat content

The crude fat was determined by Soxhlet extraction as described in method No. 30-10 (AACC, 2000) [2]. Dried sample remained after moisture determination was taken in a thimble and placed in extraction tube of Soxhlet apparatus. About 250 ml of Hexane was added in 500 ml bottom flask connected to Soxhlet apparatus. The fat was extracted by running Hexane over the sample at the rate of 3-4 drops per sec for about 5 h. The solvent was recovered and the flask was kept in hot air oven for 10 min at 40-50^{0}C. The flask was cooled in desiccator and weighed. Fat percentage was calculated according to the following formula.

$$\text{Crude fat (\%)} = \frac{\text{Final weight of flask} - \text{Empty weight of flask}}{\text{Weight of sample}} \times 100$$

2.2.6 Determination of carbohydrate content

Carbohydrates were calculated by difference method as follows.

Carbohydrates = 100 - %(Moisture + Fat + Protein + Ash)

2.2.7 Crude fiber

Crude fiber was determined by following the method No. 32-10 as described in (A.A.C.C., 2000) [2]. Moisture and fat free sample was taken and placed in 1000 ml beaker. 200 ml solution of 1.25 % H_2SO_4 was added in the beaker. The sample was then digested by boiling for 30 min. Then it was filtered using suction apparatus. The residue was washed with hot water until become acid free. The residue was again Transferred to 1000 ml beaker and boiled with 200 ml solution of 1.25 % H_2SO_4 for 30 min, filtered and the residue was transferred to pre-weighed crucible and dried in an oven at 100 ºC till constant weight was obtained. The dried residue was charred on a burner and ignited into muffle furnace at 550-600 ºC for 5-6 hours, cooled in desiccator and weighed. The loss in weight during incineration represents the weight of crude fiber in sample. The crude fiber percentage was calculated by using the following formula.

$$\text{Crude fiber (\%)} = \frac{\text{Weight of residue} - \text{Weight of ash}}{\text{Weight of sample}} \times 100$$

2.2.8 Tomato pickle preparation

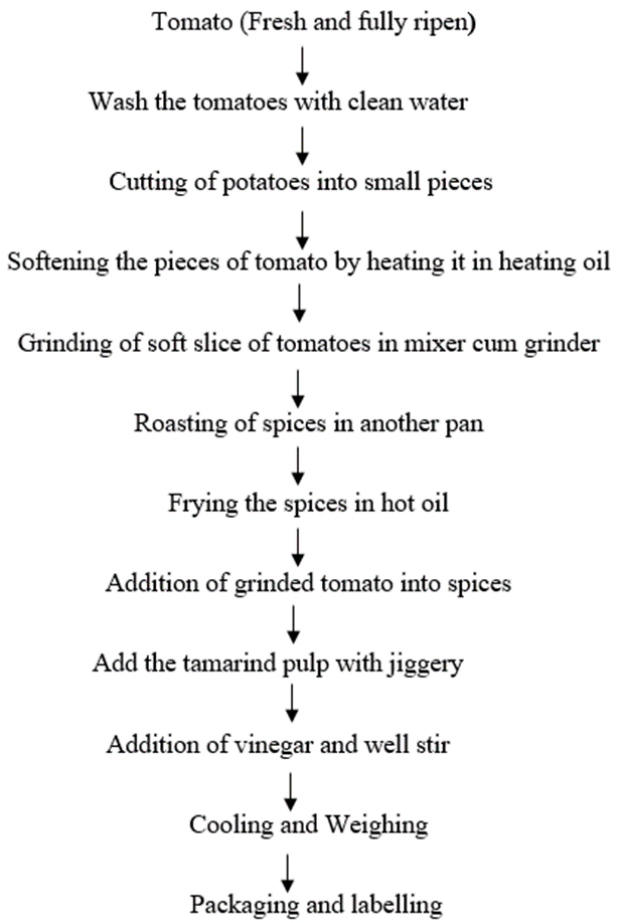

Fig 1

2.3 Sensory Evaluation

Ashwagandha root powder added ice cream sample was evaluated for sensory characteristics by using 9-point hedonic rating scale ranging from like extremely to dislike extremely (as per method given by Srilakshmi, 2002) [11].

3. Results and Discussion

3.1 Sensory evaluation of tomato pickle

Prepared samples of tomato pickle were served to semi trained judges for evaluation of organoleptic properties *viz*., color, flavour, taste, texture and overall acceptability. The average score recorded by panel member was considered and presented and discussed in following table.

Table 1: Sensory Evaluation of Prepared product

Treatments	Color	Flavor	Texture	Appearance	Taste	Overall Acceptability
T_1	8	8	7	8	8	8
T_2	7	6	7	8	6	6

T_1 is tomato pickle with addition of jaggery
T_2 is tomato pickle without of jaggery

Results in table revealed that the sample T_1 recorded highest score in all sensory properties and found to be overall acceptable over the other sample. The taste of tomato pickle was influenced by the addition of jaggery. The sample containing jaggery was extremely liked for its taste attribute with highest score value for sample T_1 (8) followed by sample T_2 (6). The sample T_1 scored similar with T_2 for textural properties. The flavour score significantly lower for pickle sample T_2. Decrease in flavour may be due to lack of jaggary in sample T_2.
The pickle containing 15 per cent jaggery proportion was found to be overall acceptable and liked by all sensory panel members. As jaggery imparts slightly sweet taste and its flavor, it will compensate the taste of tomato paste.

3.2 Nutritional profile of tomato pickle per 100 gm
In the present investigation sincere efforts were been made to evaluate the nutritional profile of tomato pickle *viz*., moisture, fat, protein, carbohydrate, ash and total energy. Data regarding the nutritional profile showed in table 2.

Table 2: Nutritional Profile of Tomato Pickle per 100 gm

Sr. No.	Nutrients	Values (Per cent)
01	Total Energy	262Kcal
02	Carbohydrate	36.4
03	Moisture	55
04	Ash	24.7
04	Protein	12.7
05	Fat	7.29

Table 2 reveals the proximate composition of tomato pickle. From the table it was noted that among the nutrients tomato pickle is rich in carbohydrate followed by protein, fat and total mineral i.e. ash. The obtained results showed the somewhat close agreements with the results obtained by Narsing et. al., (2011) [10].

3.3 Shelf life of prepared product
Prepared product was assessed for its shelf life by sensorial analysis over a period of 20 days. Pickle was packed in HDPE pouches and kept under refrigeration. From the investigation following results were obtained

Table 3: Sensory evaluation of product over a period of 20 days

Storage Days	Color	Flavor	Taste	Texture	Overall Acceptability
1	8	8	8	7	8
5	7.9	7.9	7.8	7	8
10	7.7	7.6	7.4	6.8	7.8
15	7.5	7.4	7.3	6.6	7.6
20	7.3	7.2	7.1	6.2	7.2

Prepared product subjected for sensory evaluation showed significant decrease in sensorial properties over 20 days of period. It was observed that colour was changed significantly from sensorial score of 8 to 7.3 at the end of storage period. Furthermore score for flavour was changed from 8 to 7.2. At the end from the investigation it was revealed that tomato pickle could be shelf stable up to 20 days.

4. Conclusion
It can be concluded that good quality pickle can be made by adding jiggery (15 Per cent). The prepared pickle was organ oleptically acceptable with desirable nutritional qualities. Prepared pickle shelf stable over a period of 20 days.
Hence, this developed technology of pickle supplemented with jaggery opens new avenue to the pickle fonder along with health benefits. The developed technology was simple cheaper and can be commercially explored for pickle entrepreneurs to launch a new innovative product along with nutritional health benefits to the consumers.

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