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Development and standardization of pasteurized sliced vegetable mix preserved with cover liquid

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Abstract
Vegetables are commercially important and nutritionally indispensable food commodity. Man has kept these commodities in his diet to provide variety, taste, interest, aesthetic appeal and to meet certain nutritional requirements. Vegetables along with fruits are termed as 'Protective foods'. Bell pepper varieties (*Capsicum annuum*), French beans (*Phaseolus vulgaris*), Onion (*Allium cepa*), Carrot (*Daucus carota*) are the seasonal vegetables, which are rich in nutritional and medicinal properties. A study was conducted to prepare pickle samples with the blend of vegetables i.e. Sample A (Bell Pepper; French Beans; Onion; Carrot: 25%; 25%; 25%; 25%) Sample B (Bell Pepper; French Beans; Onion; Carrot: 30%; 30%; 10%; 30%) Sample C (Bell Pepper; French Beans; Onion; Carrot: 35%; 35%; 20%; 10%). The diced vegetables bell peppers and French and Carrots were blanched at 60°C, 90°C respectively. Then the vegetable blends were pickled and pasteurized at 80˚C for 30 minutes. The final product samples were analyzed for pH, acidity, salt, calcium chloride and the stability was monitored through microbiological and sensory analysis. The results revealed that the sample-C was found more acceptable in terms of sensory and other stability parameters.

Keywords: bell pepper, French beans, onion, carrot, physicochemical properties, microbial analysis, sensory evaluation

1. Introduction
The capsicum fruit is rich in vitamin 'C' content which is about 118.6 mg/100 g. Other vitamins like vitamin 'A', 'B6', 'B12' and 'E' are also present (Anon., 2011) [1]. Capsicum has medicinal properties too such as antioxidant and antimicrobial properties; improves immune system, enhanced metabolism and even for cancer treatment (Yang *et al*., 2004) [11].

French beans are used as a green vegetable, green shelled, or dry as pulses according to the stage of harvest. In temperate regions, green mature pods are cooked and eaten as a vegetable. Immature pods are marketed as fresh, frozen, or canned, whole or fresh cut (Stanley 1995) [10]. French bean is very nutritious and its dry seeds contain 22% protein, 1.7% fat, 78% of carbohydrates, 381 mg of calcium, 425 mg phosphorus and 12.4 mg iron per 100 g of edible proteins (Joshi and Rana 1995) [4]. The immature pods of this crop are consumed as vegetable and dried seeds form an excellent pulse. It is said to be anti-diabetic and good for bladder burns, diarrhea, dropsy, dysentery, eczema, hiccups. Globally French bean is cultivated on about 28 million ha with a production of 19 million tones.

Onion (*Allium cepa*) is an ancient spice, native to Asia, and it is long noted for its flavoring and pickling properties. From the Latin word "cep"' meaning onion, Greeks valued it for its curative powers, while Egyptians ate it raw. Today, onion is an indispensable ingredient for flavoring many ethnic cuisines, whether sauteed, roasted, or pickled. Indians savor it not only for its flavor but also for the texture and consistency it provides to curries (Lecain *et al*., 1999) [5]. There are many types of onions that vary in color, size, and flavor, such as yellow, red, purple, Italian, sweet, and pearl onions, and shallots. Pickled onions are eaten in large quantities in many European countries. Onion pickles are prepared out of two types, namely (i) brown or dark red onion 28–45 mm diameter and white or silver skin (pearl or cocktail) onions between 10 and 28mm in diameter. These onions are produced by planting with high plant density. The onions are first peeled and allowed to ferment in 10% brine solution for 24–96 hours. During fermentation sugars from the bulbs are converted to lactic acid and a small amount of acetic acid and alcohol. The fermentation is controlled by adding small quantities of lactic acid. The pickled bulbs are bottled in vinegar, possibly darkened with caramel and pasteurized at 80ºC. Onion is characterized by its distinctive flavour and pungency which is due to sulphur containing compounds available in the scales of bulbs. The sulphur is in the form of various non-protein amino acids which include the precursors of volatile flavor compounds (Ibrahim, N. D. 2010) [2].

Carrots (*Daucus carota* L.) are more than a versatile orange vegetable. Original carrots were purple and yellow, initially described in the 10th century in Iran and northern Arabia (Simon 2000) [9]. Orange carrots have mainly supplanted these other colors in the west, but purple and yellow carrots persist in some areas of Turkey, India, and China and red carrots in Japan. Thorough documentations of the domestication and historical development of carrots have been published (Rubatzky *et al*., 1999; Simon 2000) [7, 9]. This review describes the nutritional value of orange as well as that of other carrots, nutritional improvements researchers have made through biofortification, the bioavailability of pigments from carrots and their impact on vitamin A status, and, finally, the putative health benefits attributed to carrots. Whole food-based approaches to enhance health by utilizing functional foods like biofortified carrots are currently popular (Jacobs and Tapsell 2007) [3].

Pickling is the technique where food is preserved in common salts or vinegar. Nutrients contained in pickles depend on the ingredient used for making them and, usually, pickles are low in calories. In view of the above advantages and abundant availability of vegetables a study was under taken to preserve the vegetables by picking process without compromising the sensorial characters and stability of food.

2. Materials and Methods

Materials: Yellow capsicum (julienne), French beans, Pickled white onion-julienne slices, Carrot (julienne slices) were Global Green Pvt Ltd, Located at Venkatapur, Zaheerabad, Telangana State, India.

Chemicals: The chemicals used in the investigation are of analytical grade. Sodium Hydroxide, Hydrochloric acid, Sulphuric acid, Sodium carbonate, Copper sulphate and Petroleum ether were obtained from Molychem, India. Bromocresol green, Phenolphthalein, Boric acid and Methyl red indicator were obtained from Qualigens, India.

Equipments: Dicer, Blancher, Sealing machine, Weighing balance, Media filling machine, Pasteurizer of Global Green Pvt Ltd, Located at Venkatapur, Zaheerabad, Telangana State, India were used for production

Methods: The experiment was conducted under full-scale conditions at Global Green Pvt Ltd, Located at Venkatapur, Zaheerabad, Telangana State, India. Four types of mixed vegetables pickles (Table 1) were produced in the factory with the production line of pickle. French beans before mixing, wash with normal water and drained out excess water then mix with yellow capsicum julienne slices, French beans slices, diced onion juliennes, carrot julienne slices both mix together as per filling ratio for weighing-filling into pouch.

Table 1: Formulations of sliced vegetable mix

Ingredients	Control	A	B	C
Yellow capsicum	30	25	30	35
French beans	25	25	30	35
Onion	33	25	10	20
Carrot	14	25	30	10

Fresh Pickling media preparation: Pickling media was prepared by mixing the following ingredients as shown in table 2.

Table 2: Pickling media composition

S. No.	Ingredients	Qty in (%)
1	Acetic acid	1.1
2	Salt	3.3
3	Sugar	10.1
4	Calcium chloride	0.1
5	Water	85.4

Yellow capsicum, Carrot, Beans, Onion
↓
Washing
↓
Cutting
↓
Blanching
↓
Weighing
↓
Filling
↓
Add media (45-50%) into pouches
↓
Sealing (temp 450-50°C)
↓
Pasteurization
↓
Cooling

Fig 1: flow chart of sliced vegetable mix

Table 3: Final packed Product specifications

S. No.	Parameters	Unit	Standard
1	Pouch size	1kg metalized pouch	TSS pouch
2	Fill weight	g	525+/-10
3	Media weight	g	415+/-10
4	Net weight	g	900(min)
5	NDW	g	500(min)
6	Media filling temp	°C	45 to 50
7	Sealing width	mm	8mm

Physicochemical analysis

$P^{H:}$ Taken 10ml of sample in triplicates and calibrated the P^H meter using buffer solution 4.0. and measured the P^H.

Acidity: Taken 5-10ml of sample in triplicates into volumetric flasks and made up to a known volume (100ml). Pipette out 10ml of dilute solution from each sample into three different conical flasks and add 2-3 drops of phenolphthalein solution. Heat the solutions slightly and titrate against 0.1N NaOH solution shaking vigorously till pale pink end point. Note the titer value and calculate result as percent anhydrous acid.

Calculation

$$\% \text{ Acidity} = \frac{\text{Titer value x normality of alkali x volume made up x equivalent weight of acid x 100}}{\text{Volume of sample taken for estimation x sample aliquot x 1000}}$$

Salt and Calcium chlorides were analyzed according to AOAC, 2012 procedures.

Microbial Analysis

Ten gram analytical unit of each food sample (mixed vegetable pickle mix), was homogenized with 90 ml of sterile Ringer's solution for 2 min and then 10 fold serial dilutions were prepared in sterile Ringer's solution (APHA, 2001). Briefly, individual serial decimal dilutions, starting with the prepared sample and each of the subsequent dilutions were prepared in 9 ml volume of sterile Ringer's solution up to 1×10^{-6} dilution, of the original food sample. Triplicate 1 ml inoculums of appropriate dilutions were pour plated, on the following media; for enumeration of total plate counts (TPC) on plate count agar and for enumeration of yeast and moulds on potato dextrose agar (). The inoculated petri plates were incubated at 37°C for 48 h for TPC and at 25°C for 48 h for yeast and moulds, respectively. Colonies were counted and expressed as colony forming units (cfu) per gram. Standard enumeration procedures were followed (Speck, 1975).

Sensory Evaluation

Sensory Analysis was carried out by a panel of 15 untrained panelists and 5 trained panelists at Global Green Pvt Ltd, Located at Venkatapur, Zaheerabad, Telangana State, India. The panelists were asked to rate the samples as per the Hedonic scale. They were given written instructions and asked to evaluate the products for acceptability based on its appearance, flavour, texture, taste, color and overall acceptability using nine-point hedonic scale (1 = dislike extremely to 9 = like extremely; Meilgaard *et al*., 1999) [6].

3. Results and Discussion

Acidity was found low in sample A(sliced vegetable mix) and sample-B(sliced vegetable mix) compared with sample-

C(sliced vegetable mix) and Salt concentration was found optimum in Sample- C(sliced vegetable mix) when compared with Control sample, Sample-A (sliced vegetable mix) and sample -B were found very low concentration compared with sample – C(sliced vegetable mix).Sample C(sliced vegetable mix) found to be high content of Calcium than compared with the control sample and sample –A, (sliced vegetable mix) sample-B(sliced vegetable mix). P^H was low in sample C (sliced vegetable mix) mix) compared with sample-A(sliced vegetable mix) and sample-B(sliced vegetable mix).

Pasteurized product was found very low compared with the Pasteurized product. In total plate count (Pasteurized product) 80 cfu/ml and (unpasteurized product) 56000 Cfu/ml. Yeast & mold has found nil in pasteurized product in unpasteurized product 3300.

Table 4: Microbial content in sliced vegetable mix

Parameters	Pasteurized product	Unpasteurized product
Total plate count	80	56000
Yeast & mold	Negative	3300
Coli forms&*E.coli*	Negative	Negative

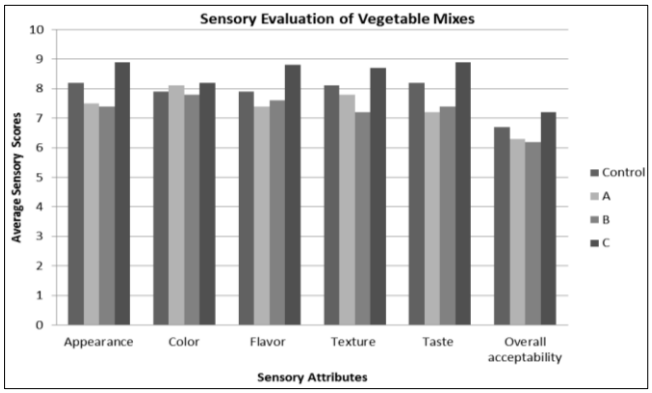

Fig 1: Average sensory scores of Vegetable mixes

4. Conclusion

The application of picking as a preservation technique to preserve mixed vegetables have better stability, enhanced taste and balanced nutrients in the final product samples. Among different formulations i.e. control, sample –A sample -B, sample – C sliced vegetable mix sample - C was standardized and found to be good physical chemical properties compared with the control sample. It is conclude that pasteurized product was found to be good product compared with unpasteurized product. As it is free from pathogens and has the enhanced sensory characteristics. Sliced vegetable mix-C rated higher sensory score for overall acceptability by the consumers and also has low viable counts.

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