

## Changes Occur On Nutritional Value of Beetroot (“*Beta Vulgaris*”) after Pickling

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### ABSTRACT

Beetroot, botanically called “Beta Vulgaris” is taproot portion of the beet plant. Beetroot are rich in many valuable active compounds and nutrients. Therefore, beetroot ingestion can be considered a factor in disease prevention. The present study aimed at the formulation of pickle product. The beetroot pickle were prepared by three different standardized methods in three different samples of Beetroot Pickle - A (100 % beetroot salty pickle prepared by raw beetroot) , Beetroot Pickle - B ( 100 % beetroot sweet pickle prepared by steamed beetroot ) and Beetroot Pickle -C ( 100 % beetroot salty pickle prepared by boiled beetroot ) . The developed pickles were sensory evaluated by judges where using Nine-Point hedonic scale. The result indicates that Pickle-C were most acceptable than other two preparations .The fresh beetroots and most acceptable beetroot pickles sample were chemically analysed by standard AOAC ,2000 methods for Betaine , Vitamin C , Iron , Folate , Choline and Calcium . The results showed that all Nutritional profiles were decreasing from fresh beetroots to beetroot pickles . But it was found that Vitamin C content was increased in Beetroot Pickles than fresh beetroots.

**Keywords:** Beetroot , Pickle , Vitamin C , Betaine , AOAC, Nine-Point Hedonic.

### INTRODUCTION

Pickling is one of the oldest known methods of preserving foods, and a long-time favourite among home canners<sup>5</sup> .It plays a very important role in Indian cuisine . It doubles the taste of food adds a spicy flavour and palatable to eat. Indian pickling process are different from other countries mainly due to additional spice mixture added to them .<sup>2</sup> It also plays the role of appetizer<sup>11</sup> , some dishes are incomplete without pickles .<sup>2</sup> Pickles are prepared using fresh vegetables through fermentation , beneficial microorganisms naturally attached on the surface of the vegetables and produce acid during fermentation<sup>6</sup> . Traditionally manufactured pickles are source of healthy probiotic microbes, which occur by natural fermentation in brine but pickles produced using vinegar are not probiotic .<sup>8</sup> Lactic acid bacterial

fermented pickles have many health benefits as it improved intestinal tract health,<sup>11</sup> Enhanced immune system function , inflammation relief , maintenance of gut flora that may help to control weight gain and appetite , positively impact brain function and behavior and so on .<sup>3</sup>

Most vegetables and fruits contain more than 80 % water and therefore are highly perishable<sup>1</sup>. There are several healthful ways to preserve food so that we can save the goodness of fruits and vegetables long after the harvest is over . Home preservation is a very economical choice .<sup>7</sup> Beetroot (Beta Vulgaris) is very nutritious vegetables . It contains no fat , very few calories and is great source of folate , fiber and several antioxidants (Carotenoids and flavonoids) .It also contain the significant amount of Vitamin C and Vitamin A in the form of Beta

-Carotene and it also contains small amounts of Vitamin B1, B2, B3, Calcium, Magnesium, Potassium and Sodium etc<sup>10</sup>.

The objective of this research works are to develop Beetroot Pickle, to identify the sensory evaluation of Beetroot Pickle, to analyse fresh beetroot and nutritional changes in beetroot after pickling.

## MATERIALS AND METHODS

### Materials procurement

Beetroots Organically produced in the Ghala Farm, Hardoi Bypass Road, Lucknow, (U. P) were used for making Beetroot Pickles and all required ingredients like spices, salt and oil etc. Were collected from local market. The beetroot was washed and peeled and cut into small pieces of about 3-4 cm in rectangular shape. The Beetroot Pickles were prepared by three different standardized methods in which 250 mg of fresh beetroot were mixed with spices, salt and oil in equal quantity but in Beetroot pickle-B (Sweet pickle) 100 gm of sugar were also added for preparing the pickle in place of salt and oil were excluded. The Control pickle were prepared with lemons in which 250 lemons were thoroughly washed under running water to remove traces of dirt, dust and to reduce microbiological load then they were cut into four pieces by using knife. After that lemons were also mixed with spice, salt and oil in same quantity which were used for preparing beetroot pickles. All different samples were prepared after several trials as described in Table 1 and Fig. 1.

Beetroot Pickle - A (100% beetroot salty pickle prepared by raw beetroots)

Beetroot Pickle - B (100% beetroot sweet pickle prepared by steamed beetroots)

Beetroot Pickle - C (100% beetroot salty pickle prepared by boiled beetroots)

Control Pickle- (Lemon pickle prepared by raw lemons)

### Sensory evaluation

The sensory quality of beetroot pickles' samples were evaluated using Nine-Point Hedonic Scale.<sup>4</sup> A semi-trained sensory panel of twenty members drawn from Babu Banarasi Das University, Lucknow and Eras Lucknow Medical College and

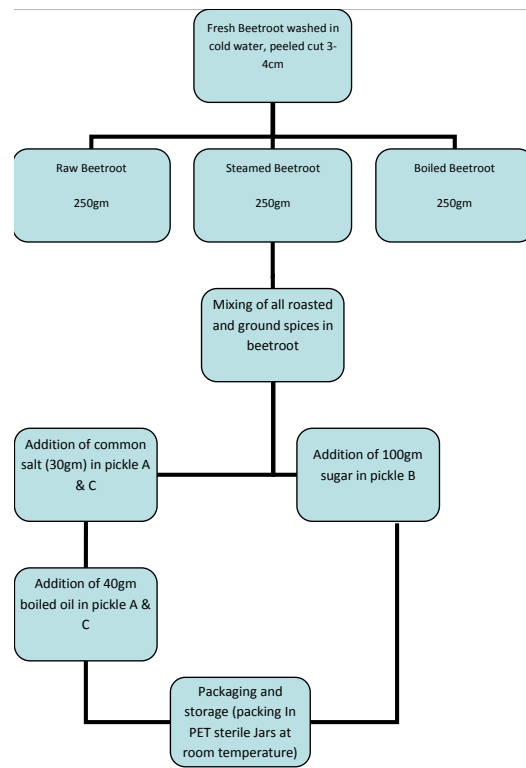
Hospital. The panelists were asked to evaluate the product for different sensory attributes namely colour, appearance, aroma, texture, taste and overall acceptability.

### Chemical analysis

The fresh beetroots and most acceptable beetroot pickles sample were analysed for Betaine, Vitamin C, Iron, Folate, Choline and Calcium were determined as per procedure of AOAC (2000).<sup>9</sup>

## RESULTS AND DISCUSSIONS

In current study, four formulations of beetroot pickles were estimated (Beetroot Pickle – A



**Fig.1: Flow chart of preparation method beetroot pickle**

, Beetroot Pickle - B , Beetroot Pickle -C and Control Pickle ) for Colour , Appearance , Aroma , Texture , Taste and Overall acceptability scores of pickle were demonstrated in ( Table No- 2 ) .The acceptability of beetroot pickle were judged by panels of twenty semi-trained members .

The Pickle-C which is developed by 100 % beetroot salty pickle prepared by boiled beetroots was highly acceptable than other two pickles A and B which are prepared by raw and steamed beetroot. The mean score of pickle-C having highest scores in all sensory values than other two pickles (Pickle-A and Pickle-B) . The mean scores of highly acceptable pickle having colour –  $8.45 \pm 0.887$  , appearance-

$7.95 \pm 0.826$  , aroma- $8.05 \pm 1.050$  , texture-  $8.25 \pm 0.716$  , taste- $8.25 \pm 0.550$  and Overall acceptability-  $8.25 \pm 0.550$  .It was observed that the sensory characteristics of most acceptable pickle ( Pickle-C ) were highest because the pickle prepared by boiled beetroots were more tender and soft than other two pickles , all aroma and flavour of spices were more absorbed in boiled beetroots than raw or steamed beetroots .

The nutritional composition of most acceptable beetroot pickles and fresh beetroots were analyzed and presented in table- 3.

**Table 1: Condiments and spices mixed used in preparation of beetroot pickles per 250 gm beetroot**

Ingredients	Percentage of Condiments and spices in pickle A, C & control pickle	Percentage of Condiments and spices in pickle B (sweet pickle)
Coriander Seeds	5.0 g	5.0 g
Tamarind Powder	15.0 g	15.0 g
Black Mustard Seeds	5.0 g	5.0 g
Fenugreek seeds	2.5 g	2.5 g
Nigella seeds	5.0 g	5.0 g
Fennel seeds	5.0 g	5.0 g
Mustard oil	40 .0 g	-
Chili Powder	5.0 g	5.0 g
Common Salt	30.0 g	-
Sugar	-	100 g

**Table 2: Sensory evaluation score of beetroot pickle**

Sensory Attributes	Control Pickle (Lemon pickle prepared by raw lemons)	Beetroot Pickle- A (100 % beetroot salty pickle prepared by raw beetroots)	Beetroot Pickle - B (100 % beetroot sweet pickle prepared by steamed beetroots)	Beetroot Pickle - C (100 % beetroot salty pickle prepared by boiled beetroots)
Colour	$8.85 \pm 0.366$	$7.95 \pm 0.759$	$6.80 \pm 0.834$	$8.45 \pm 0.887$
Appearance	$8.75 \pm 0.639$	$7.25 \pm 0.550$	$6.15 \pm 1.040$	$7.95 \pm 0.826$
Aroma	$8.75 \pm 0.550$	$7.40 \pm 0.681$	$6.65 \pm 0.745$	$8.05 \pm 1.050$
Texture	$8.90 \pm 0.308$	$7.35 \pm 0.933$	$5.60 \pm 1.095$	$8.25 \pm 0.716$
Taste	$9.05 \pm 0.224$	$6.90 \pm 0.852$	$6.40 \pm 1.046$	$8.25 \pm 0.550$
Overall Acceptability	$8.90 \pm 0.447$	$7.15 \pm 0.671$	$6.85 \pm 0.671$	$8.25 \pm 0.550$

**Table 3: Nutritional value of fresh beetroot and beetroot Pickle per 100 gm**

Nutritional constituents	Fresh beetroot	Beetroot Pickle (100 % beetroot salty pickle prepared by boiled beetroot)
Betaine	125 mg	20.6 mg
Vitamin C	7.95 mg	8.95 mg
Iron	0.789 mg	0.620 mg
Folate	89 mg	9.70 mg
Choline	6.5 mg	0.50 mg
Calcium	11.650 mg	4.255 mg

The data indicates that all analyzed nutritive values were decreasing from fresh beetroot to beetroot pickle except the value of vitamin C. The value of betaine was decreased from 125 to 20.6 mg / 100 g, iron (0.789- 0.620), folate (89 to 9.70  $\mu$  / 100 g), choline (6.5 to 0.50 mg / 100 g) and calcium (11.650-4.255). But the nutritive value of vitamin C was increased from 7.95 to 8.95 mg / 100 g by fresh beetroot to beetroot pickle.

The study indicates that the pickle prepared by boiled beetroots have highest acceptability among other two beetroot pickles . All the nutritional profile of fresh beetroot is higher than beetroot pickle but it was found that contentment of vitamin C was higher in beetroot pickle. The reason may be as followed. Due to addition of tamarind powder and chili powder in beetroot pickle the amount of Vitamin C was increased . The beetroot pickle was nutritionally

analysed just after 5 days of preparation i.e. it was not fully fermented . All other nutrients in beetroot pickle such as calcium , iron and folate were decreased in beetroot pickle due to addition of spices in beetroot pickle because spices having antinutrients such as tannin , phytate , oxalate and saponins so they bind the availability of these nutrients and the values of these nutrients were decreased in beetroot pickle .

Although the sensory values of beetroots were improved after pickling but on nutritional point of view fresh beetroots were more superior, so we suggested that try to eat fresh beetroot instead of pickled one.

Further studies are required to evaluate the nutritional changes occurs in beetroot pickles after long time storage.

## REFERENCES

- Amerine, M., Pangborn, R., & Roessler, E., Principles of sensory evaluation of food, New York : Academic Press: (1965).
- Horwitz, W. , *Official methods of analysis of AOAC International*. Gaithersburg, Md.: Association of Official Analytical Chemists (2000).
- Ingham, B. *Homemade pickles & relishes*. Madison, WI: University of Wisconsin—Extension, Cooperative Extension; 1-60: (2008).
- Kay, G. & Nickols, S. *Remaking home economics*. Athens, GA: University of Georgia Press: (2015).
- Kumar, Y. , Beetroot: A Super Food, *IJESTA*; 1(3): 20-26: (2015).
- Mahalingam, S. Pickling Process Preserving Foods by traditional fermented methods. *IJIIT*; 4(5): 18 – 20: (2015).
- Noonari, S. & Memon MS, I. . Performance of

- Pickle Production Processing and Marketing in Sindh Pakistan. *J Food Process Technol*; **6**(12):2-6:(2015).
8. P.Awasthi, "Sensory and Nutritional Evaluation Of Value Added Cakes Formulated By Incorporating Beetroot Powder"; *International Journal Of Food And Nutritional Sciences*; **3**(6): 145-148:(2014).
  9. Sharma, S., Agarwal, N., & Verma, P. , Probiotics: The Emissaries of Health from Microbial Worl. *Journal Of Applied Pharmaceutical Science*; **2**(1):138-143:(2012).
  10. Ul Khaskheli, S., Zheng, W., Ahmed sheikh, S., Ahmed Khaskheli, A., Liu, Y., Wang, Y., & Huang, W. ,Effect of Processing Techniques on the Quality and Acceptability of Auricularia auricular Mushroom Pickle. *Journal Of Food And Nutrition Research*; **3**(1):469-475:(2015).
  11. W. Li, S. Zhang and Q. Li, "Changes of anthocyanin, vitamin C content and antioxidant activities of purple cabbage pickle during fermentation process", *Scholars Academic Journal of Biosciences*; **2**(12):925-929:( 2014).