CHANGES IN PHYSICO-CHEMICAL PROPERTIES OF MANGO PICKLE DURING STORAGE

ABSTRACT

The present study was carried out to investigate the effect of recipes and varieties of Mango (Mangifera indica L.) pickle on changes in physico-chemical properties during storage. This study was undertaken to investigate the changes in physico-chemical properties of mango pickle during storage at the Post Graduate Laboratory of the Department of Horticulture, College of Agriculture, Central Agricultural University, Imphal, 2020. The experiment was laid out in factorial randomized block design (FRBD) with eight treatments and three replications. The treatments consist of four pickled recipes and two varieties. Among all pickles, the salty pickle was found to have maximum pH whereas, the sweet mango pickle was found to be minimum. The TSS increases continuously during storage irrespective of the recipe and variety used. Sweet pickle showed maximum TSS. Among all pickles, oily mango pickle was found to have maximum moisture content whereas, salty mango pickle was found to be minimum. Sweet mango pickle has the highest score and is organoleptically more acceptable among other types of a pickle. The findings also showed that with the advancement of the storage period organoleptic quality improved in all mango pickles. The local mango was also found to be the better variety for pickling. It can be concluded that mango of the local kind was better suited for pickling.

Keywords: Mango, pickle, pH, TSS, moisture, chlorophyll, acceptability

INTRODUCTION

Mango (*Mangifera indica* L.) belongs to the family Anacardiaceae and originated in the Indo-Burma region. It is one of the choicest fruits in the world (Joshi *et al*., 2013) and is also one of the most preferential fruit crops of the tropical and subtropical regions of the world for human consumption (Vasugi *et al*., 2012). Due to its taste, importance and luscious flavour, *M. indica* is often named the "King of fruits". Its social and economic impact is most relevant in developing and emerging countries, where mango is a high-valued component in the diet, rich in vitamins and minerals (Ribeiro *et al*., 2007).

Mango fruits are usually eaten fresh because of their succulence, exotic flavour and delicious taste. Nutritionally, mango is a good source of bioactive compounds such as provitamin A, vitamin C, carbohydrates, organic acids, minerals, anti-oxidants, fibres and proteins (Masibo and He, 2009). Raw fruits of local varieties of mango trees are used for preparing various traditional products like raw slices in brine, amchur, pickle, murabba, chutney, sherbet, etc. Pickling, the commonly used method of preservation began as a way to preserve food for out of season use and for long journeys. Mango pickle is prepared by using a fully mature mature raw mango. It is also one of the oldest and most successful methods of food preservation known to humans. So far, not much research has been done in relation to mango pickling and its standardization of recipe in the Northeast region especially in Manipur. Considering the above factors, the study entitled "Effect of Recipes and Varieties on Mango (*Mangifera indica* L.) Pickle" was done. Considering the above factors, this study was done to investigate the effect of recipes and varieties of Mango (*Mangifera indica L.*) pickle on changes in physico-chemical properties during storage.

METERIALS AND METHODS

Immature mango fruits of Totapuri and Local varieties free from blemishes, any visible disease infestation and physical injury were collected from Horticulture Research Farm, Central Agricultural University, Andro, Imphal East. Other materials *viz*., chemicals and spices were procured from the local market of Imphal, Manipur. The mango fruits were washed with clean water and wiped dry with a muslin cloth. It was then cut into pieces of convenient sizes removing the stones. The mango pieces were mixed with salt and filled in large jars and kept for a week at room temperature, shaking it occasionally. It was then removed from the jar and excess brine solution drained off and dried in the air followed by pickle preparation. The salt concentration was 20 per cent for salty mango pickle (P1) and 15 per cent salt for sweet (P2), oily (P3)

and vinegar (P4) mango pickles. The experiment included the combination of 2 mango varieties and 4 mango pickle recipes. The details of which are given below:

(a) Variety: 2

V1 - Local

V2 -Totapuri

(b) Recipe: 4

P1 - Salty mango pickle

P2 - Sweet mango pickle

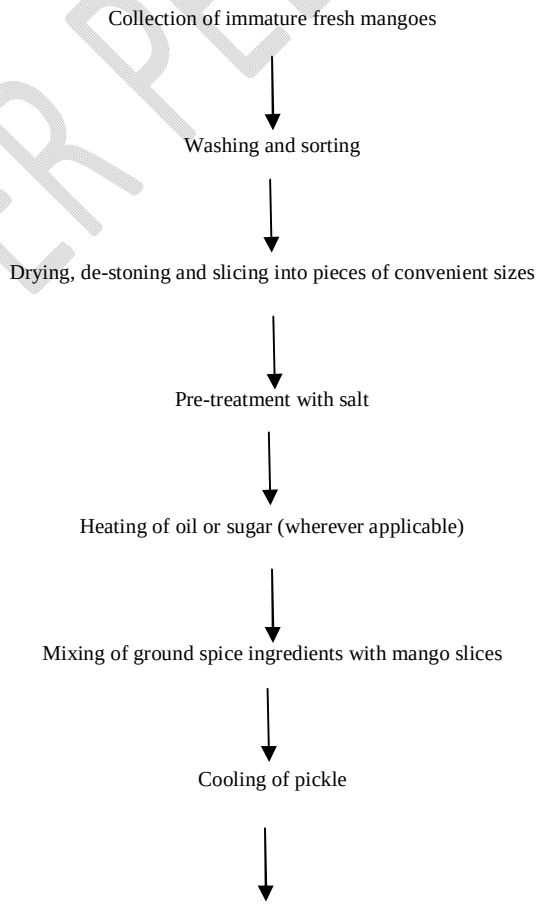
P3 - Oily mango pickle

P4 - Vinegar mango pickle

Preparation of Mango Pickle

Four recipes for mango pickles were selected for standardization. Variations were made in the contents of each recipe. Uniform size slices were made from the composite samples of brined mango pieces which were taken with varying amounts of other ingredients for the preparation of pickles in these recipes. The following recipes as presented in Table 1 were used for the preparation of mango pickles. Figure 1 represented the steps involved during the preparation of mango pickles. The resulting pickles were filled in glass jars and stored at room temperature for use in the estimation of the changes in various quality parameters. Pickle prepared by using different recipes were analysed at 0, 30, 60 and 90 days of storage for their chemical properties i.e., total titratable acidity (Ranganna, 2007), total sugar (Yemm and Willis, 1954), ash content (Ranganna 2007), microbial evaluation (Ranganna 2007) and organoleptic quality (Amerine *et al*. 1961).

Fig. 1 Flowsheet for preparation of mango pickle



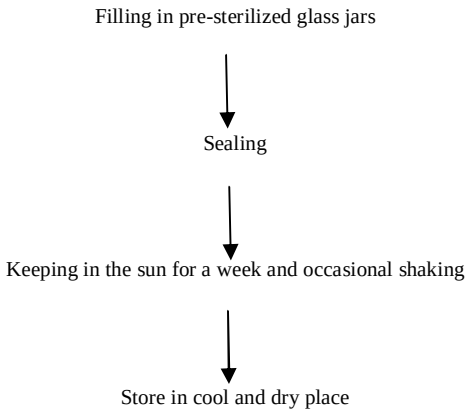


Figure 1. Flowsheet for preparation of mango pickle

Table 1. Different recipes used for preparation of mango pickle

Ingredients	**Recipes**			
	P_1	**P_2**	**P_3**	**P_4**
Unripe mango pieces	1 kg	1 kg	1 kg	1 kg
Turmeric	20 g	20 g	20 g	20 g
Mustard seed	50 g	50 g	50 g	50 g
Black pepper	5 g	5 g	5 g	5 g
Fenugreek	40 g	40 g	40 g	40 g
Red chilli powder	20 g	20 g	20 g	20 g
Fennel seeds	10 g	10 g	10 g	10 g
Cumin seed	20 g	20 g	20 g	20 g
Salt	200g	150g	150g	150g
Jaggery	-	500 g	-	-
Mustard oil	-	-	500 ml	250 ml
Vinegar	-	-	-	100 ml

RESULTS AND DISCUSSION

The pH value of the pickles decreases as the storage period increases in all the recipes and mango varieties. A decrease in pH can be attributed to increasing in acidity. Acidity increased in pickles due to lactic acid fermentation. Fermentation has been known to decrease pH and increase titratable acidity in several foods. Similar results of decrease in pH with storage period were also reported by Saroj and Singh (2018) in mango pickles and Sharma (2002) in lime pickles. There was a significant increase in TSS during 90 days of storage period irrespective of recipe and variety used. An increase in the TSS value of pickles may be possible due to the jaggery, salt and other ingredients being added and mixed well during the storage period. Increase in TSS could also be due to loss of moisture. A similar trend was reported by Singh *et al.* (2021) in cauliflower pickles. The study revealed a considerable decrease in moisture content of all mango pickles throughout the storage period. The

reduction in moisture content was due to adding of more salt and sugar which causes osmosis. So, the salty pickle showed a considerable decrease in moisture content showed a maximum decrease in moisture which might be due to its already dryness. Similar results were observed by Sharma (2002) in lime pickles and Saroj and Singh (2018) in mango pickles. There was a general decreasing trend in chlorophyll content of mango pickles during storage. Further, while comparing the overall effect of varieties it was retained higher in local variety and lesser in Totapuri mango during storage. The decrease in chlorophyll content of pickles might also be due to its photo-oxidation in transparent containers during storage. The same trend was observed in seedling mango pickle by Thakur *et al.* (2017).

Table 2. Effect of different recipes and varieties on pH, TSS (^{0}B), Moisture content (%) and Chlorophyll content (mg/g) of mango pickle at different storage days

Treatment	pH				TSS (^{0}B)				Moisture content (%)				Chlorophyll content (mg/g)			
	0	30	60	90	0	30	60	90	0	30	60	90	0	30	60	90
Recipes																
P1	2.41	2.28	2.16	2.14	8.43	9.53	11.17	12.45	0.61	0.99	1.07	1.34	1.28	1.23	1.17	1.13
P2	2.17	2.11	2.01	1.94	10.27	11.45	13.60	14.57	0.56	0.72	0.90	1.28	1.44	1.37	1.22	1.16
P3	2.30	2.21	2.09	2.06	8.03	9.30	10.98	12.22	0.42	0.56	0.79	1.07	1.24	1.21	1.16	1.12
P4	2.25	2.19	2.06	2.01	8.82	10.00	12.02	12.85	0.48	0.64	0.85	1.17	1.31	1.26	1.19	1.15
S.E(d) (±)	0.02	0.02	0.02	0.03	0.11	0.07	0.07	0.09	0.01	0.03	0.01	0.02	0.01	0.01	0.00	0.00
C.D	0.04	0.05	0.05	0.06	0.24	0.15	0.15	0.20	0.03	0.07	0.02	0.04	0.01	0.02	0.01	0.01
Varieties																
V1	2.20	2.10	1.93	1.87	9.63	10.62	12.58	13.24	0.55	0.79	0.96	1.25	1.44	1.39	1.27	1.22
V2	2.36	2.29	2.23	2.20	8.14	9.53	11.30	12.80	0.49	0.67	0.85	1.19	1.20	1.15	1.10	1.06
S.E(d) (±)	0.01	0.02	0.02	0.02	0.08	0.05	0.05	0.07	0.01	0.02	0.01	0.01	0.00	0.01	0.00	0.00
C.D	0.03	0.04	0.03	0.04	0.17	0.10	0.11	0.14	0.02	0.05	0.02	0.03	0.01	0.01	0.00	0.00

Table 3. Effect of different recipes and varieties on flavour, texture and overall acceptability of mango pickle at different storage days

Treatment	9-point Hedonic rating											
	Flavour				Texture				Overall acceptability			
	0	30	60	90	0	30	60	90	0	30	60	90
Recipes												
P1	6.75	7.17	7.25	7.58	6.58	7.25	7.42	7.75	7.17	7.25	7.58	7.58
P2	7.83	8.08	8.25	8.67	7.25	7.92	8.08	8.25	7.92	8.42	8.58	8.75
P3	7.17	7.50	7.50	7.92	7.58	8.25	8.42	8.75	7.42	7.58	7.92	8.08
P4	7.58	7.75	7.92	8.33	6.92	7.42	8.00	8.08	7.75	7.92	8.25	8.42
S.E(d) (±)	0.30	0.25	0.28	0.30	0.21	0.29	0.21	0.24	0.21	0.22	0.22	0.24
C.D	0.60	0.51	0.57	0.22	0.43	0.58	0.19	0.48	0.42	0.45	0.44	0.20
Varieties												
V1	7.46	7.75	7.92	8.21	7.17	7.79	8.04	8.29	7.67	7.88	8.17	8.29
V2	7.21	7.50	7.54	8.04	7.00	7.63	7.92	8.13	7.46	7.71	8.00	8.13
S.E(d) (±)	0.21	0.18	0.20	0.21	0.15	0.20	0.15	0.17	0.15	0.16	0.15	0.17
C.D	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Data regarding the organoleptic quality of pickles revealed that the overall acceptability of pickles increased significantly with the increase in storage period. Flavour and texture showed improvement in their quality. Sweet pickles obtained the highest score with respect to their overall acceptability than that of other recipes. Mango oil pickle and vinegar pickle also scored higher which might be due to their gravy formation and salty pickle scored less due to its dryness. The increase in organoleptic quality in pickles throughout the storage period can be attributed to the conversion of the insoluble fraction of pectin to soluble form which might have resulted in softening of the pickle. Similar results were obtained by Sharma (2002) in lime pickles and Rekha (2004) in kachri pickles. The interaction between the recipes and mango variety could not show a significant effect on the mango pickle.

CONCLUSION

It can be concluded that the local variety mango was more suitable for pickle making due to low pH, lower moisture content and higher overall organoleptic scores than Totapuri. Among the recipes sweet mango pickle scored the highest organoleptic scores and is the best recipe for making pickles. The texture obtained out of oily mango pickles was also very well received. The organoleptic quality of pickles improved with the increase in storage period in all the recipes.

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