ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 2, Issue 10, October 2017

Effect of pectinase enzyme on physicochemical properties of guava juice and process standardization for Guava Syrup

[1] Prof. P. D. Shere, [2] Dr. D. M. Shere
[1] MIT College of Food Technology, MITADT University, Pune
[2] College of Food Technology, VNMKV, Parbhani

***Abstract*— Efforts were made in present investigation to utilize guava pulp to prepare guava juice using pectinase enzyme. The process was standardized for enzyme concentration, incubation period and optimum temperature based on juice yield, clarify and chemical composition of clarified guava juice. Addition of pectinase enzyme at 0.75% level to guava pulp and incubating the pulp enzyme mixture at 7.5 hr at 450C was found to be superior to other treatments. The clarified juice obtained was higher in TSS, acidity and ascorbic acid as compared to control. The juice obtained was standardized for preparation of guava syrup. Results revealed that good quality guava syrup can be prepared by maintaining juice: sugar ratio of 1:0.75 and acidity at 0.8 %.**

Key words: Guava pulp, juice yield, pectinase, guava syrup

INTRODUCTION

Guava (Psidium guajava L.) is a tropical fruit usually consumed as fresh. It is rich in ascorbic acid (100-200mg/100gm) higher than a fresh orange juice (Sidhu 2006). In addition it is good source of Vitamin A, dietary fiber, potassium, magnesium and anti oxidant pigments such as carrotenoids and polyphenols (Mahattanatawee et al. 2001). Guava is one of the easiest fruits to process as it does not show problems of physical or chemical nature in relation to pulp browning during processing. The consumption of tropical fruit juice has been increasing currently because it is natural, high in nutritional values and used as an alternative to other beverages such as soft drinks, tea and coffee. Manufacture of clean guava juice is difficult simply by mechanical processing of guava mash. The high content of ascorbic acid remains in pomace (Kaur et al 2009). The use of enzyme in mash treatment is essential to increase juice yield, ascorbic acid and juice clarity.

Therefore, present study was undertaken to optimize the enzyme concentration, incubation time and temperature of enzyme and to utilize the juice in preparation of guava syrup.

MATERIALS AND METHODS

Ripened guava with 80-90% maturity and free from visible blemishes and bruises were purchased from local market of Pune. Fruits were washed, cut into small pieces and pieces were ground in to mixer sieved through sieve to separate pulp and seeds. The pulp was packed in to polyethylene bags (300 gauge), sealed and stored at -180C till it was used for juice extraction.

Preparation of clarified guava juice

Guava pulp

The pulp was treated with pectinase enzyme (Novoenzyme-denmark) at different levels (0.25, 0.5, 0.75 and 1 per cent) to decide the optimum concentration. The pulp-enzyme mixture was incubated for different incubation period (0, 2.5, 5.0, 7.5 and 10 hrs) in a water bath (30+20C). At the end of incubation period pulp was heated at 900C for 10 minutes to inactivate the enzyme. Finally juice was cooled and filtered through double layered muslin cloth. The filtrate was centrifuged at 5000 RPM for 10 minutes to obtain clarified juice.

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 2, Issue 10, October 2017

Clarified guava juice

Preparation of guava syrup

Guava juice was utilized for the preparation of guava syrup by adding sugar and acid at different levels. The sugar levels selected were 1:0.75, 1:1 and 1:1.5 (juice: sugar) and varying acidity levels from 0.6, 0.8, 1.0, 1.2 and 1.4 percent. The syrup was diluted in 1:3 proportion and evaluated for best proportion using semi trained panel members with 9 point hedonic rating for its colour, flavour, taste and overall acceptability. Total ascorbic acid, moisture content, titratable acidity and total soluble solids were determined according to the standard procedures (AOAC 1995).

RESULTS AND DISCUSSION

Effect of enzyme concentration on yield and quality of guava juice.
The result pertaining to chemical quality of guava juice and yield are presented in table -1

Table -1: Effect of enzyme concentration on yield and quality of guava juice.

Sr.No.	Enzyme concentration (%)	TSS ^{0}Brix	pH	Acidity (%)	Juice yield (%)	Ascorbic acid mg/100 ml
1	0.00	9.0	4.1	0.63	74.00	198.70
2	0.25	9.5	4.0	0.64	79.00	201.20
3	0.50	9.5	4.0	0.65	80.20	203.00
4	0.75	11.50	3.8	0.67	85.50	246.75
5	1.00	11.60	3.8	0.68	84.50	246.50
6	CD at 5% level	0.08	0.03	0.08	6.40	6.35

It is revealed from table that as enzyme concentration increased the yield of clarified guava juice increased (85.50%) at 0.75% enzyme concentration with maximum retention of ascorbic acid (246.75mg/100ml). This can be explained that, the pectinase which include pectin methyl esterase and polygalacturorase assist in pectin hycholysis which help in release of juice from cells. As enzyme concentration increased there was gradual increase in TSS and total titratable acidity along with marginal decrease in pH. Similar findings were reported by Imungi et al (1980), Askar et al (1992) and Brasil et al (1995). The increase in TSS may be due to hydrolysis of non-reducing sugars. The ascorbic acid was also increased with corresponding increase in enzyme concentration in pulp mixture. The maximum ascorbic acid was reported in clarified juice when pulp was treated with 0.75 and 1% pectinase enzyme. This could be due to the reaction of enzyme on guava peel which is rich is ascorbic acid. Thus, the increment of ascorbic acid would be due to pectin breakdown from peel portion (Chopda and Barret, 2001). Hence enzyme concentration of 0.75% was found efficient from yield and ascorbic acid retention point of view.

In further experiment pulp treated with 0.75% pectinase enzyme was incubated at various incubation periods ranging from 0 to 10 hours and results obtained are presented in table -2

Table -2 effect of incubation period on yield and quality of clarified guava juice

Sr.No.	Incubation treatment (h)	TSS ^{0}Brix	pH	Acidity (%)	Yield (%)	Ascorbic acid (mg/100 ml)
1	0.0	9.0	4.1	0.64	71.3	198.7
2	2.5	9.0	4.1	0.64	73.0	200.00
3	5	10.00	4.0	0.65	79.5	221.10
4	7.5	11.00	3.8	0.68	85.5	245.50
5	10	11.00	3.7	0.70	85.8	246.80
	CD at 5% level	0.97	0.35	0.06	1.85	1.21

Maximum (85.8%) clarified guava juice was obtained at 10 h of incubation. Higher time of incubation than 7.5 h is not desirable from yield point of view. Ascorbic acid content also increased progressively with the increase in incubation period. There was maximum ascorbic acid retention at 7.5h. This was probably due to complete degradation of pectin from pulp and peel during 7.5 h of incubation period (Chopra and Barret 2001). The other

ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Vol 2, Issue 10, October 2017

chemical parameters were not much affected during incubation period.

The process of preparing juice was also standardized for optimum temperature and results are presented in table- 3

Table -3 Effect of temperature on yield and quality of clarified guava juice.

Sr.No.	Incubation temperature (^{0}C)	TSS ^{0}Brix	pH	Acidity (%)	Yield (%)	Ascorbic acid (mg/100 ml)
1	25	9.0	4.1	0.64	71.30	198.70
2	35	10.0	4.0	0.65	78.50	205.20
3	45	11.0	3.9	0.68	85.30	240.50
4	55	10.50	3.9	0.66	79.80	220.70
	CD at 5% level	0.25	0.66	0.08	1.50	1.30

After standardizing the enzyme concentration and incubation period, the process was standardized for optimum temperature. Incubation of pulp with 0.75% enzyme concentration was carried out from 250C to 550C. It was observed that highest yield of juice (85.30%) was obtained at incubation temperature of 450C. The increase in temperature higher than 450C had negative effect on yield of juice. Thus, a good quality clarified guava juice can be obtained by treating the pulp with 0.75 % pectinase enzyme and incubating the mixture for 7.5 h at 450C temperature.

The guava juice was also utilized in preparation of guava syrup at 1:0.75, 1:1 and 1:1.5 level of guava juice to sugar ratio with varying levels of acids ranging from 0.6 to 1.4%. The results are presented in figure 1.

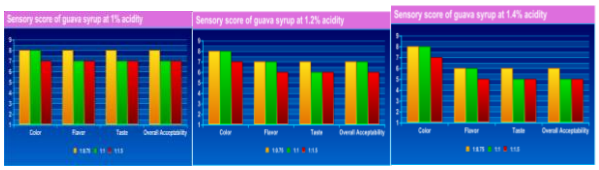

Figure-1: Sensory score of guava syrup at 0.6, 0.8, 1, 1.2 and 1.4 % acidity

It can be clearly seen from figure that guava syrup with 1:0.75 (Guava juice: sugar) with 0.8 % acidity scored maximum with respect to colour, taste, flavour and overall acceptability, higher levels of sugar or acids were not preferred by the panellists.

Thus, guava syrup with good retention of ascorbic acid can be prepared with 1:0.75 level of juice: sugar with 0.8% acidity in the final guava syrup.

CONCLUSION

The pectinase enzyme treatment was studied for concentration , incubation period & temperature with effect on yield & quality of guava juice. The study concluded 0.75% enzyme concentration, 7.5h incubation period at 45oC yielded guava juice with higher TSS, acidity & ascorbic acid content. The process was also standardized for preparation of guava syrup which concluded that 1:0.75 (Guava juice:sugar) ratio at 0.8% acidity had higher organoleptic acceptability.

REFERENCES

[1] A.O.A.C. (1995). Official Methods of Analysis. Association of Official Agricultural Chemists, 16th Edition USA.

[2] Askar, A., El - Samahy, S. K. and ABD El - Salem, N.A. (1992). Production of instant guava drink powder. Confructa - studien 36(5 - 6):154 - 161.

[3] Brasil, I. M., Geraldo, A.M. and Raimundo, W.F. (1995). Physico - chemical changes during extraction and clarification of guava juice. Food Chem. 54 (4):383 - 386.

[4] Chopda, C.A. and Barrett, D.M. (2001) Optimization of guava juice and powder production. J. Food Process Preserv. 25: 411-430.

[5] Imungi, J.K., Scheffeldt, P. and Saint - Hilire, P. (1980). Physico-chemical changes during extraction and clarification of juice. Lebensm - Wiss. u. Technol. 13: 248-251.

[6] Kaur, S, B.C. Sarkar and K. Sharma (2009) optimization of enzymatic hydrolysis pretreatment conditions for enhanced juice recovery from guava fruit using response surface methodology. Food Bioprocess Technol. 2:96-100

[7] Mahattanatawee, K.J., A. Manthey, G. Luzio, S.T. Talcott, K. Goodner, A. J. imenez- Escrig, M. Rincon, R. Pulido and F. Saura-Calixto (2001). Guava fruit (Psidium guajava L.) as a new source of antioxidant, dietary fiber. J. Agric. Food Chem. 49:5489-5493

[8] Sidhu J.S. (2006) Tropical fruits: Guava, lychee and papaya. In: Y.H. hui, J. Barta, M.P. cano, J.S. Sidhu and N.K. Sinha (Eds). Handbook of fruits and fruit processing. Black well publishing, lowa P.P 597-624.