Development of jelly from box myrtle (*Myrica nagi*) and its quality evaluation during storage

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 Received: 28.12.2015/Accepted: 4.5.2016

ABSTRACT

Box myrtle (*Myrica nagi*) is a rich source of antioxidants like phenols and anthocyanins besides other quality characteristics. Therefore investigation was conducted to develop a commercial jelly and conduct its quality evaluation during storage. Different combinations of juice and sugar were tried to standardize proper combination for jelly. The jelly prepared by following the best selected recipe was packed in glass and PET jars and stored for six months under ambient and refrigerated temperature conditions. It could be safely stored for a period of six months under both the ambient and refrigerated conditions without much change in various quality characteristics. However the changes in the quality characteristics were slower in refrigerated storage conditions as compared to ambient conditions.

Keywords: Box myrtle, *Myrica nagi*; jelly; storage; quality characteritics

INTRODUCTION

Box myrtle (*Myrica nagi*) is an important wild fruit which is known as Kaafal in Himachal Pradesh. It belongs to genera *Myrica* and family Myricaceae. Among the various species *M nagi* is a sub-temperate, evergreen wild tree found throughout the mid-Himalayas between 1300 to 2000 meters amsl. The fruits of *M nagi* are rich source of antioxidants along with other classes of chemicals (Jeeva et al 2011).

The juice of this fruit is very attractive and sparkling red in colour and ripe fruits are consumed as a potential source of formulations for nutraceuticals or natural food (Saklani et al 2012). No work on processing of this fruit has been reported so far. So being a rich source of antioxidants specially colour pigments like anthocyanins as well as sugars this fruit can be exploited for the development of jelly. Thus the present studies were undertaken to develop jelly from this fruit and investigate its storage life.

MATERIAL and METHODS

The mature fruits of *M nagi* were procured from Dumadevi area of Mandi district of Himachal Pradesh. Fruit jelly was prepared by mixing known quantity of box myrtle juice in sugar syrup of different treatment combinations. The mixture was cooked to desirable consistency until the TSS of product reached near 65°B. To get desirable concentration of acid (0.75%) in fruit jelly, acid in the form of citric acid was added to the different treatment combinations. Pectin was added to all the treatment combinations.

The jelly prepared by following the best selected recipe was packed in pre-sterilised glass and PET jars (200 g capacity). All the jars were properly labelled and stored at ambient (20-25°C) and low temperature (4-7°C) conditions for six months. The physico-chemical and sensory characteristics were estimated at zero, three and six months of storage. The colour of jelly was observed visually by comparing with the colour cards of Royal Horticulture Society, London and the card numbers were mentioned along

with the colour. TSS, reducing sugars, titratable acidity, pectin, ascorbic acid content and anthocyanins were determined according to Ranganna (1997). Total phenol content was determined by Folin-Ciocalteu procedure given by Singleton and Rossi (1965). Nine point hedonic rating test was followed for conducting the sensory evaluation. Data on physico-chemical characteristics were analysed by CRD before and during storage whereas data pertaining to the sensory evaluation were analyzed by using RBD. The experiments were replicated three times.

RESULTS and DISCUSSION

Standardization of recipe for the preparation of box myrtle jelly

Data on sensory characteristics of different recipes of box myrtle jelly given in Table 1 indicate that the mean colour score was highest (8.50) in J_4 and lowest (7.10) in J_1. The maximum texture score of 8.30 was obtained by the same recipe and minimum (7.03) in J_1 closely followed by J_5. The highest score (8.10) of taste was awarded to J_4 while J_8 got the lowest score of 7.23 which was statistically at par with J_1. The maximum (8.17) score for aroma was recorded in recipe J_4 while minimum was in J_8 (7.10). The highest score (8.22) of overall acceptability was recorded in J_4 and lowest (7.18) in J_1 which was statistically at par with J_2, J_6 and J_8. It was thus concluded that the recipe with 55 per cent juice and 45 per cent sugar (J_4) was best on the basis of sensory characteristics of jelly.

Storage of box myrtle jelly

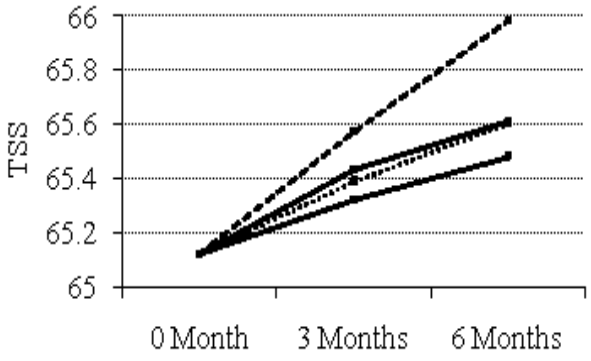
Physico-chemical characteristics: The colour of box myrtle jelly as per Royal Horticultural Society Cards was retained as such ie Red group 46 (B) during six months of storage under refrigerated conditions while under ambient storage conditions colour of jelly changed from Red group 46 (B) to Red group 46 (A) in both the packaging materials. The decrease in colour intensity of jelly was observed during storage. The reason for decrease in colour intensity of jelly during storage might be due to degradation of anthocyanins pigment. However both the packaging materials showed their equal effect on colour of jelly during storage. Similar trend of decrease in colour intensity has been reported by Assis et al (2007) in cashew apple jelly.

The TSS of jelly increased slightly (Fig 1a) during storage and this increase might be due to hydrolysis of polysaccharides into monosaccharide and soluble disaccharides. Reducing sugars of jelly showed a significant increase (Fig 1b) during storage which was comparatively more in ambient storage conditions than in refrigerated conditions. This increase might be due to hydrolysis of starch into sugars as well as conversion of complex polysaccharides into simple sugars and hydrolysis of non-reducing to reducing sugars. The jelly showed a slight decrease in titratable acidity (Fig 1c) during storage which was comparatively more under ambient conditions as compared to refrigerated storage conditions. However with respect to packaging material this decrease in titratable acidity was non-significant. The increase in titratable acidity might be due to co-polymerization of organic acids with sugars and amino acids.

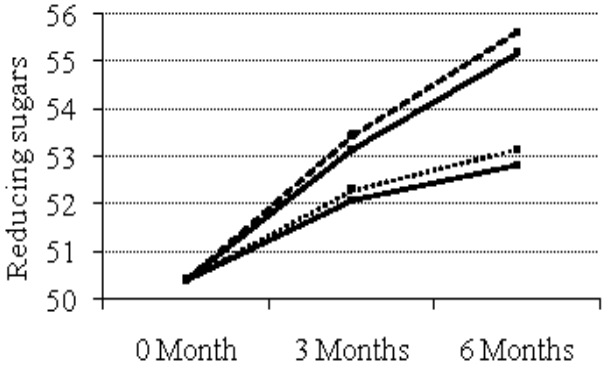
There was a decrease in pectin content (Fig 1d) of jelly during storage and possible reason may be hydrolysis of pectin into simple compounds. Ascorbic

Table 1. Sensory characteristics (score) of different recipes of box myrtle jelly

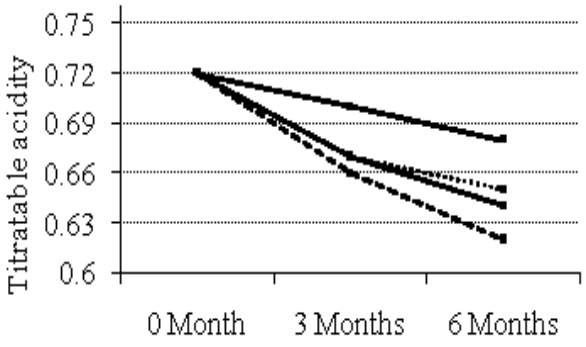
Treatment (juice and sugar %)	Colour	Texture	Taste	Aroma	Overall acceptability
J_1 (40 and 45)	7.10	7.03	7.37	7.43	7.18
J_2 (45 and 45)	7.50	7.20	7.67	7.47	7.35
J_3 (50 and 45)	7.80	7.63	7.80	7.77	7.72
J_4 (55 and 45)	8.50	8.30	8.10	8.17	8.22
J_5 (40 and 50)	7.47	7.10	7.83	7.80	7.72
J_6 (45 and 50)	7.60	7.37	7.63	7.37	7.43
J_7 (50 and 50)	8.17	7.47	7.47	7.53	7.52
J_8 (55 and 50)	8.00	7.37	7.23	7.10	7.44
$CD_{0.05}$	0.19	0.09	0.18	0.23	0.27



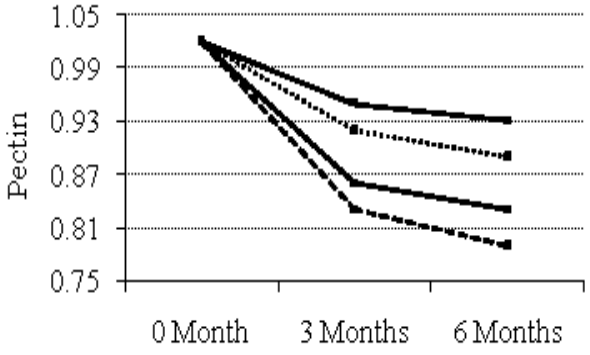
a. TSS



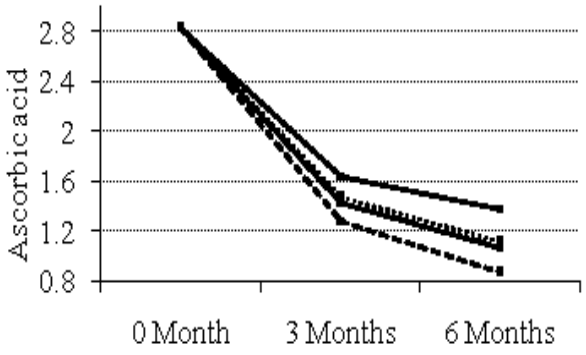
b. Reducing sugars (%)



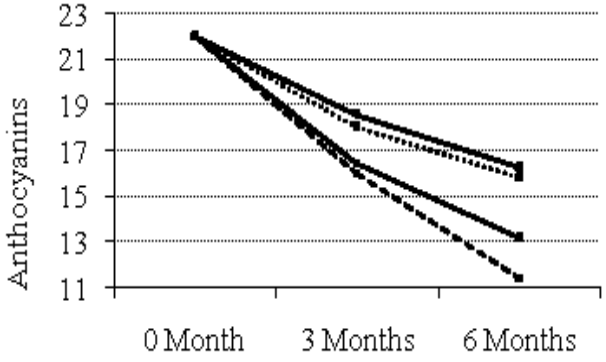
c. Titratable acidity (%)



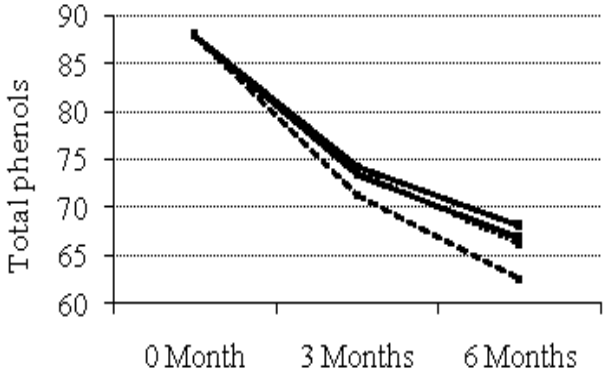
d. Pectin (% calcium pectate)

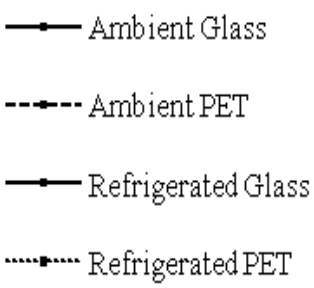


e. Ascorbic acid (mg/100 g)



f. Anthocyanins (mg/100 g)





g. Total phenols (mg/100 g)

Fig 1. Effect of storage on physico-chemical characteristics of box myrtle jelly

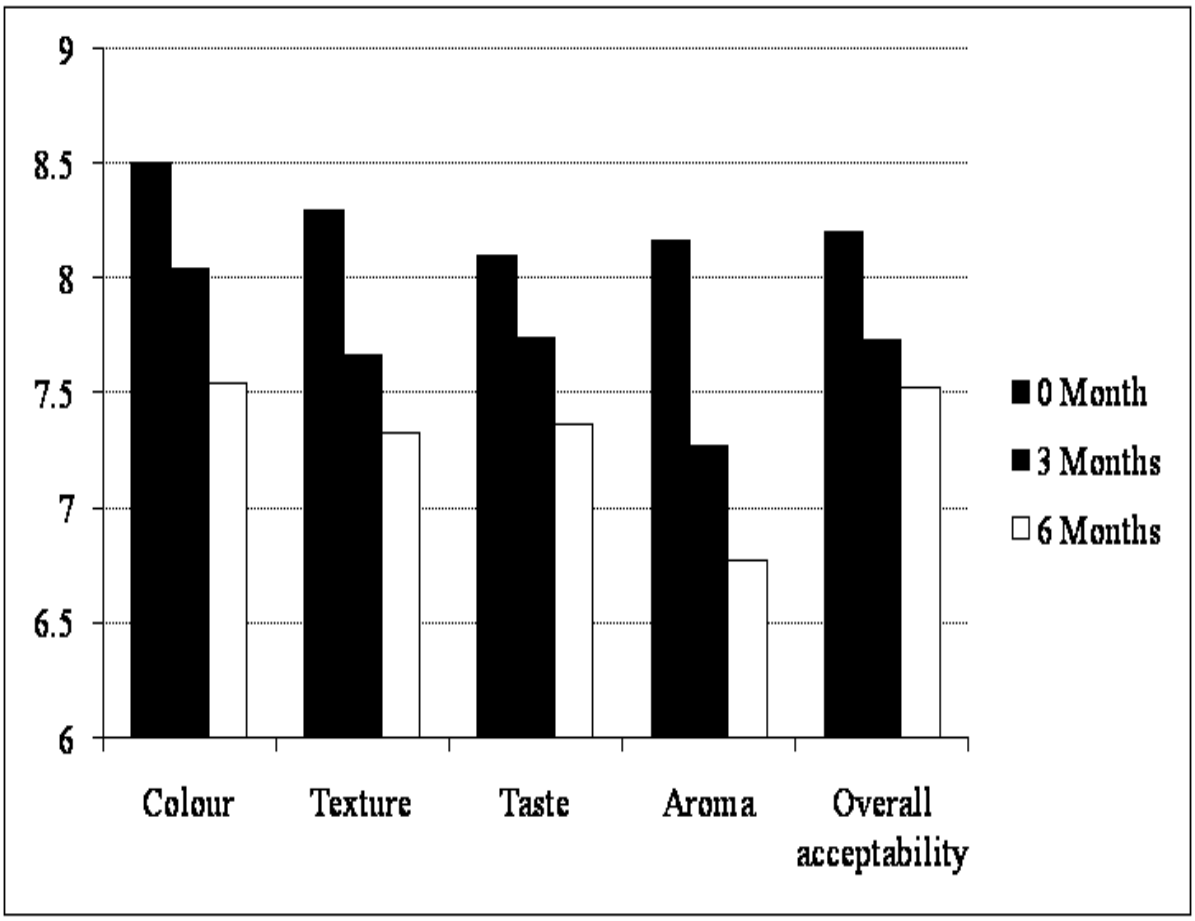


Fig 2. Effect of storage on sensory characteristics of box myrtle jelly

acid content of jelly decreased significantly during storage however the decrease was lower in refrigerated storage conditions than ambient conditions. Decrease in ascorbic acid (Fig 1e) content might be due to its degradation into dehydro-ascorbic acid or furfural during storage. Retention of higher ascorbic acid was observed in glass jars than PET jars during storage. A significant decrease in anthocyanins content (Fig 1f) of jelly was recorded during the storage and less loss of anthocyanins was observed under refrigerated storage conditions than ambient conditions. Loss of anthocyanins in jelly might be due to their high susceptibility to auto-oxidative degradation during storage. A significant decrease in total phenols was recorded during storage and the decrease was lower under refrigerated storage conditions than ambient conditions. The decrease in total phenols (Fig 1g) during storage might be due to their involvement in the formation of polymeric compounds by complexing with protein and their subsequent precipitation. As far as packaging material is concerned more retention of phenols was there in jelly packed in glass jar than PET jar.

The changes in various physico-chemical characteristics during storage were comparatively more under ambient as compared to refrigerated storage conditions due to the faster rate of reaction as a result of high temperature in ambient conditions. Fewer changes in physico-chemical characteristics of jelly packed in glass jars than PET jars were observed which might be due to the difference in their thermal conductance properties which affected internal decomposition reactions. Similar trends for above said physico-chemical characteristics have been reported by Maestre et al (2000) in pomegranate jelly, Assis et al (2007) in cashew apple jelly, Sundaram et al (2007) in seabuckthorn mixed fruit jelly, Hossen et al (2009) in guava jelly and Singh and Chandra (2012) in guava-carrot jelly.

Sensory characteristics of box myrtle jelly during storage: The colour, texture, taste, aroma and overall acceptability scores of jelly decreased significantly (Fig 2) during storage and this decrease was more pronounced under ambient than refrigerated storage

conditions. Retention of higher sensory scores in refrigerated conditions might be due to the better condition of the jelly during storage as a result of slower rate of chemical reactions. Decrease in colour scores of jelly during storage might be due to the degradation of anthocyanins pigment which affected the colour of the product. The possible reason for decrease in texture scores might be due to the degradation of original texture/shape as a result of hydrolysis of pectin during storage which led the judges to award lower scores. The decrease in taste scores of product during storage might be due to loss of sugar-acid blend responsible for taste. The loss of aroma scores during storage might be due to the possible loss of volatile aromatic compounds. Decrease in overall acceptability scores might be due to cumulative loss in appearance, texture and flavour of the product during storage. Jelly packed in glass jar retained more sensory scores than PET jar. The retention of better overall sensory scores of jelly in glass jar might be due to the better retention of above given factors as a result of slower reaction rate in glass jar as compared to PET.The results are in conformity with the finding of Prasad and Bankar (1999) in pomegranate jelly, Singh and Chandra (2012) in guava-carrot jelly and Sundaram et al (2007) in seabuckthorn mixed fruit jelly.

CONCLUSION

On the basis of various quality parameters jelly with 55 per cent juice and 45 per cent sugar (J_4) was found to be the best. It could be stored safely for a period of six months under both storage conditions and also in both packaging materials like PET and glass jars. However comparatively fewer changes in jelly packed in glass jar and stored under refrigerated storage conditions were observed as compared to PET jar.

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