

PROCESSING AND STORAGE OF ALOE VERA INTO NATURALLY FLAVORED READY- TO- SERVE (RTS) BEVERAGE USING GINGER, LEMON AND PEPPERMINT EXTRACTS

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ABSTRACT

Naturally flavored aloe vera (*Aloe barbadensis* MILLER) ready-to-serve (RTS) beverage was prepared by maintaining 15°B TSS, 0.3 % acidity and blended with extracts of peppermint (0.75 & 1.00%), lime (0.75 & 1.00%) and ginger juice (0.5 & 0.75%) at different levels. Physico-chemical and sensory qualities were studied for a period of 6 months at 2 months interval. TSS and sugar:acid ratio increased gradually during the storage. Maximum TSS (16.23 °B) and sugar:acid ratio (43.33) was observed in 1 % and 0.75% peppermint blending, respectively. Significantly, maximum retention of ascorbic acid content of 85.66 and 67.15 mg/100ml was noticed in initial and six months of storage, respectively. Aloe RTS blended with 0.75 % peppermint retained luminosity (L^*) values during storage (2.69 at 6 months). The maximum overall acceptability (4.43, 4.32, 4.28 and 4.17 at 0, 2, 4 and 6 months, respectively during the storage) was observed in the blend of aloe juice 15% + TSS 15 °B + peppermint 0.75%. In conclusion, commercial production of aloe vera RTS blending with 0.75 % peppermint is recommended and the beverage can be stored up to six months with minimum loss of quality.

INTRODUCTION

Aloe vera is an industrial crop and in the food industry it has been utilized for the preparation of various health food drinks, its concentrate can be used to mix with water, tea, milk, its powder can be used in ice cream and confectionary (Seoshin *et al.*, 1995). The gel of fresh aloe leaf is a remedy for intestinal worms in children and anti-dysenteric, regular use of pulp is useful in prevention of abdominal tumours, dropsy, piles, sciatica and can cure tuberculosis, cancer and also Acquired Immune Deficiency Syndrome (AIDS) in the initial stages (McGuffin *et al.*, 1997). Aloe juice contains Cu, Mn, Si, Ca, K, Fe, S, Cl and vitamins A, B₃, B₁, B₆, B₂ and C (Blitz *et al.*, 1969). The current food trend toward healthier diets makes juice consumption an important natural food alternative, and improves the availability of its nutritive compounds. Blending of fruit juices of different fruits or different varieties is a common practice to improve the acceptability and shelf life. Ginger and lemon juices have anti-bacterial and anti-fungal properties (Bhardwaj and Mukherjee, 2011) and impart refreshing taste and flavour. Peppermint has refreshing, cooling and flavoring properties. Blending of juices is a novel alternative to improve and preserve the phytochemical quality (Waskar, 2011). Lemon juice blending to pomegranate juice helps to maintain the color stability as reported by Mena *et al.* (2013); and Gonzalez-Molina *et al.* (2009). Singh *et al.* (2012) flavored the aloe beverage with strawberry and vanilla to present in more acceptable form. In another study, Boghani *et al.* (2012) blended aloe juice with papaya to produce quality RTS. The

present research is aimed at utilizing the bitter aloe juice blending with suitable concentrations of lime, ginger and peppermint to produce a flavored RTS with beneficial health effects. No studies were reported on blending of naturally flavored extracts into aloe juice to make it organoleptically acceptable. Hence, an attempt is made to prepare aloe RTS with natural blends of ginger, lime and peppermint and study its effects on storage stability.

MATERIALS AND METHODS

Fresh aloe vera leaves were procured and processed. In this process, aloe leaves are hand filleted by traditional method then the green rinds and the mucilages pulp are processed separately. Total processed aloe contains considerably higher concentrations of total solids calcium, magnesium and mallic acid (Chandegara and Varshney, 2013).

After blending the aloe juice with flavors of lime, ginger and peppermint, TSS and acidity was adjusted to 15°B and 0.3 per cent with cane sugar and citric acid, respectively. The natural flavour, peppermint was added at T₁: 0.75% and T₂: 1.0%; Lime juice, T₃: 0.75% and T₄: 1.0%; and Ginger juice at T₅: 0.5% and T₆: 0.75%. The mixture was pasteurized at 85° C for 20 minutes and filled in pre-sterilized glass bottles of 200 ml capacity. The bottles were sealed, sterilized in boiling water for 20 minutes, cooled and stored at ambient temperature. The beverage was analysed for various chemical parameters at 0, 2, 4 and 6 months of storage at ambient temperature.

The TSS was analysed by using Erma-hand refractrometer. Ascorbic acid content was estimated by using 2, 6 - dichlorophenol indophenol dye titrimetrically as per the modified procedure of AOAC (Anon., 1984). Sugar: acid ratio was estimated by using the procedures outlined by Raganna (1977). The instrumental colour analysis of RTS beverage was measured by Lovibond colour meter in terms of L^* (brightness/darkness). The sensory evaluation of the product was done by five semi-trained judges by numerical scoring method. The data obtained were statistically analyzed in two factorial CRD design.

RESULTS AND DISCUSSION

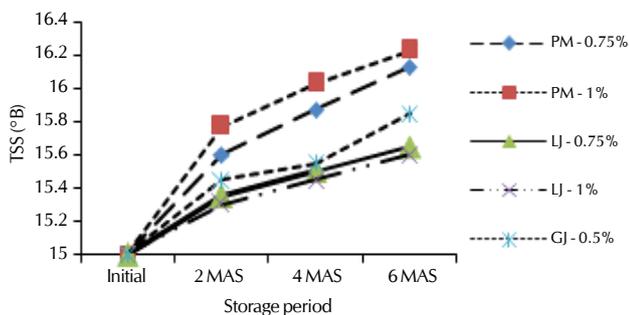
There was a gradual increase in the TSS over a storage period of blended RTS (Fig. 1). Increase in TSS during storage might be attributed to conversion of polysaccharides and other constituents of juice into sugar. Similar trends were reported by Jakhar and Pathak (2012) in ber and jamun RTS blends; Irfan (2008) in papaya mixed RTS; Tendon (2007) in bael and papaya blend RTS; Mandal (2003) in phalsa and pineapple blended RTS; and Dobhal (2000) in Phalsa. The maximum TSS of 16.23 °B was recorded in the treatment T_2 (Aloe juice 15% + TSS 15°B + peppermint 1%), followed by T_1 (16.13). However, minimum TSS was observed in treatment T_4 (15.60) which containing 15% aloe juice + 15° B TSS + 1% lime juice.

There was an increasing trend of sugar: acid ratio with increasing storage period (Fig. 2). Significant differences were

observed in treatments, storage period and interaction. Maximum sugar:acid ratio (43.33) was observed in the treatment T_1 (Aloe juice 15% + TSS 15 °B + 0.75% peppermint). However, minimum sugar:acid was observed in T_4 (22.40).

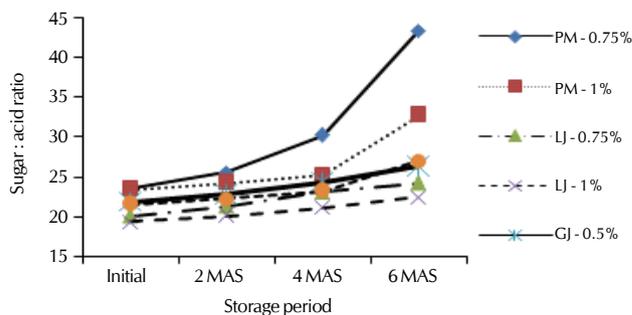
Ascorbic acid is one of the major nutritional components in aloe vera juice ascorbic acid content is very negligible in quantity. At the time of processing, ascorbic acid was added in the present study for the purpose of preventing browning in aloe juice, and to improve nutritional and antioxidant property of aloe based juice blends. The mean ascorbic acid content of aloe based RTS beverages was found to decrease from 77.86 mg/100 mL in the fresh RTS to 61.14 mg/100 mL at 6 MAS (Fig. 3). This could be attributed to light and heat labile nature of the vitamin getting affected by temperature during pasteurization and storage and by ambient conditions during storage. Similar studies on reduction in ascorbic acid was reported by Nagpal and Rajyalakshmi (2009) in RTS beverage preparation from bael and citrus fruits blends and Tiwari *et al.* (2007) in litchi RTS. Significantly maximum retention of ascorbic acid throughout the study period was observed in T_4 (15 % aloe juice + 15°B TSS + 1 % lime juice) and it ranged from 85.66 to 67.15 mg/100 ml. Conversely, the treatment T_1 (15 per cent aloe juice + 15° B TSS + 0.75 per cent pepper mint) showed significantly less ascorbic acid level with an initial value of 71.40 mg/100 ml to 54.54 mg/100 ml at the end of storage for 6 months.

The mean L^* values decreased with increasing storage period



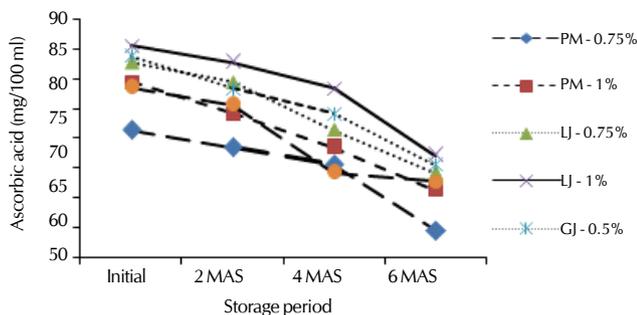
*MAS - Months after of storage; PM - Peppermint; LJ - Lime juice; GJ - Ginger juice

Figure 1: Changes in TSS (°B) of flavoured aloe RTS during storage



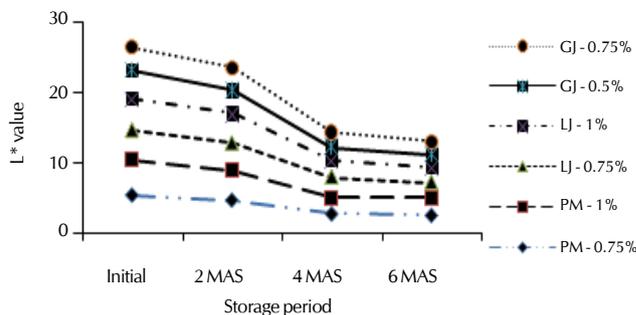
*MAS - Months after of storage; PM - Peppermint; LJ - Lime juice; GJ - Ginger juice

Figure 2: Changes in sugar: acid ratio of flavoured aloe RTS during storage



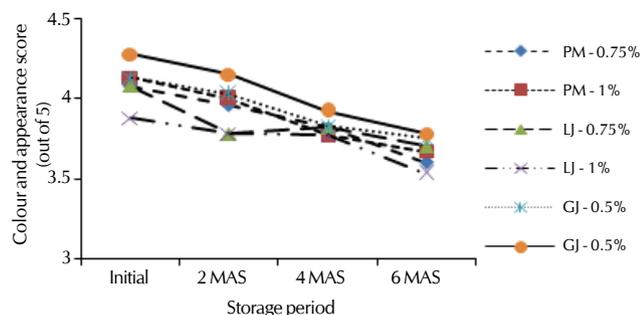
*MAS - Months after of storage; PM - Peppermint; LJ - Lime juice; GJ - Ginger juice

Figure 3: Changes in ascorbic acid (mg/100ml) of flavoured aloe RTS during storage



*MAS - Months after of storage; PM - Peppermint; LJ - Lime juice; GJ - Ginger juice

Figure 4: Changes in the L^* values of flavoured aloe RTS during storage



*MAS - Months after of storage; PM - Pepper mint; LJ - Lime juice; GJ - Ginger juice

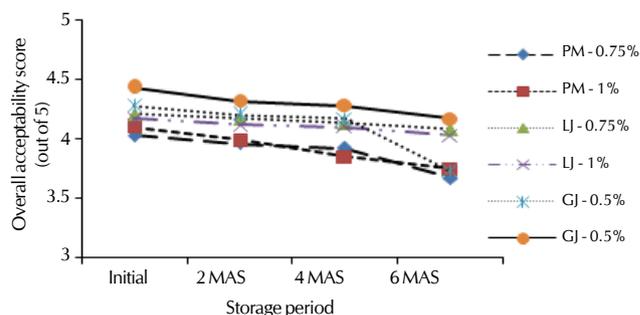
Figure 5: Changes in colour and appearance scores of flavoured aloe RTS during storage

in flavoured aloe RTS (Fig. 4). Significantly maximum L^* value was observed in treatment with 0.75% peppermint (5.52, 4.82, 2.89 and 2.69, respectively) at 0, 2, 4 and 6 months after storage.

Organoleptic scores for colour and appearance and overall acceptability of aloe based RTS beverages decreased in all the treatments as the storage time progressed. This decrease may be due to degradation of colour and changes in flavour and taste of stored samples. Decrease in sensorial profile of RTS beverage during storage is also reported by several workers viz., Satkar (2013), Gaikwad et al. (2013), Jakhar and Pathak (2012), Balaswamy et al. (2011) and Yadav et al. (2010), Jadhav et al. (2001) and Kumar and Manimegalai (2001). However, non significant difference was observed in treatments and storage period with respect to colour and appearances of blended aloe RTS (Fig. 5). The maximum score for colour and appearances (4.28, 4.15, 3.92 and 3.78 respectively,) at initial, 2, 4 and 6 months after storage was observed in the treatment T_6 (Aloe juice 15% + TSS 15°B + ginger 0.75%). The maximum overall acceptability scores of 4.43, 4.32, 4.28 and 4.17 at 0, 2, 4 and 6 months of storage, respectively in the blend involving aloe juice 15% + TSS 15 °B + peppermint 0.75% (Fig. 6).

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*MAS - Months after of storage; PM - Pepper mint; LJ - Lime juice; GJ - Ginger juice

Figure 6: Changes in overall acceptability scores of flavoured aloe RTS during storage

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