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# Effect of Maltodextrin And Tricalcium Phosphate On Quality Attributes Of Jamun Juice Powder

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**ABSTRACT**
*The present investigation entitled, "Effect of maltodextrin and tricalcium phosphate on quality attributes of jamun juice powder" was undertaken at the Department of Post harvest Management of Fruit, Vegetables, and Flower Crops, Faculty of Post Harvest Management, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist- Ratnagiri during the year 2012-2014 The experiment was conducted in F.C.R.D. with four factors viz., maltodextrin levels (10%, 15%, 20% and 25%) with 1% tricalcium phosphate and storage period (0, 30, 60, and 90 days). Based on the overall acceptability the addition of maltodextrin @ 10 and 15 per cent proved to be suitable for the production of produce high quality of spray dried jamun juice powder.*
***Key words :*** *Jamun powder, Maltodextrin, Tricalcium phosphate, spray dryer*

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## INTRODUCTION

Jamun is one of the most popular fruits of India grown throughout the country except high hills. The konkan region comprising of Thane, Raigad, Ratnagiri and Sindhudurg districts of Maharashtra state has also peculiar geographical and socio economic conditions suitable for production of neglected minor fruit crops which can be successfully grown on the hilly terrains of the konkan region. Jamun fruit is full of medicinal properties; it has antioxidants, antibacterial, polyphenols, cardiovascular properties, so it is called medicinal fruit. Jamun fruits are universally accepted to be very good for medicinal purpose especially for curing diabetes because of its effect on the pancreas (Joshi, 2001). Considering the excellent processing qualities of pulp of jamun fruit and seed, they are extensively used for the preparation of preserves, squashes, jellies, wine, vinegar, juice etc. (Nawaz, 2010). Good quality of jamun juice is excellent for sherbet, syrup and squash (Miller *et al*., 1955). Maltodextrin is a polysaccharide and it is made up from maize starch. Maltodextrin added in the pulp to reduce sticking of powder on the wall of cyclone spray dryer. Caparino *et al.* (2012) studied the effect of drying methods on the physical properties and microstructures of mango (Philippine 'Carabao' var.) powder. The maltodextrin (DE=10) was used as aid for spray drying of mango powder. Tricalcium phosphate is generally added in the pulp before preparation of powder to increase the free flowingness of powder. Tricalcium phosphate is used at the rate of 2 per cent for obtaining non-sticky free flowing powder. Jaya and Das (2003) reported that a non-sticky free flowing mango powder was produced from mango pulp of variety Totapuri with addition of maltodextrin, glycerol monostearate and tricalcium phosphate at rate of 0.62, 0.015 and 0.015 kg/kg dry mango solid, respectively. Preparation of jamun juice powder is new dimension in processing sector used in preparation of instant RTS. Therefore present investigation entitled "Effect of maltodextrin and tricalcium phosphate on quality attributes of jamun juice powder"

## MATERIAL AND METHODS

The present investigation entitled, "Effect of maltodextrin and tricalcium phosphate on quality attributes of jamun juice powder" was conducted at the Department of Post Harvest Management of Dr. Balasaheb Konkan Krishi Vidyapeeth, Dapoli. This experiment was laid out in factorial completely randomized design with four replications each comprising of four treatments and four storage period such as-

$T_1$ – 10% Maltodextrin level + 1% tricalcium phosphate
$T_2$ – 15% Maltodextrin level + 1% tricalcium phosphate
$T_3$ – 20% Maltodextrin level + 1% tricalcium phosphate
$T_4$ – 25% Maltodextrin level + 1% tricalcium phosphate
**S1-** 0 day
**S2-** 30 days
**S3-** 60 days
**S4-** 90 days

The details of material required and methods adopted during the course of investigation is as follows. The fully matured, healthy and uniform size jamun fruits were obtained from local market. Sodium benzoate was added in the jamun juice as preservative which was procured from M/S Shree chemicals, Ratnagiri. Maltodextrin used for non-stickiness and tricalcium phosphate used for free flowingness were procured from M/S Shree chemicals, Ratnagiri. Technosearch laboratory spray dryer (SPD-D-111), available in Department of Post Harvest Management, Dr. B.S.K.K.V, Dapoli was used for the preparation of spray dried powder. Food grade plastic cans were used for the preservation of jamun juice where as multi layer aluminium pouches were used for packaging of powder, which were procured from M/S Vaibhav Plastics, Thane. Weighing balance (Contech, model CA-503) available in Post Graduate Institute of Post Harvest Management, Dr. B.S.K.K.V, Dapoli was used for the analytical work. Uniformly ripened 100 kg fruits of jamun were selected for extraction of juice using pulper machine.The extracted juice was clarified manually by using muslin cloth and then transfered into food grade plastic cans. In jamun juice, maltodextrin was added @ of 10, 15, 20, and 25 per cent for preventing stickiness and tricalcium phosphate was added @ 1 per cent for free flowingness of the powder. After addition of maltodextrin and tricalcium phosphate, jamun juice was homogenised thoroughly by using mixer grinder as a stirrer and was used for preparation of powder. The machine use for manufacturing jamun juice powder was a spray dryer (SPD-D-111) from Technosearch laboratory which was employed for spray drying process. Immediately after spray drying the powder was packed in the multilayer aluminium pouches.

The known quantity of jamun juice was spray dried after adding Maltodextrin and Tricalcium phosphate (TCP). Bulk density of jamun powder was determined by using the method described by Goula (2004). Bulk density was determined by adding 20 g of Jamun powder to a 50 ml graduated cylinder and holding the cylinder on vibrator for 1 minute. The bulk density was calculated by dividing mass of the powder by the volume occupied in the cylinder. The colour of jamun powder was measured using colour reader (make Konica Minolta, Japan) and expressed as *L*, a* and b** values.

To the known quantity of sample the distilled water was added in the proportion of 1:3 and total soluble solids were determined with the help of hand refractometer (Atago India instrument pvt. Ltd, Mumbai) and the reading recorded was multiplied by four and TSS was expressed as °Brix. A known quantity of sample was titrated against 0.1 N sodium hydroxide (NaOH) solution using phenolphthalein as an indicator ( A.O.A.C., 1975). A known quantity of sample was blended in pestle and mortar with 20-25 ml distilled water. It was then transferred to 100ml volumetric flask and filtered. A known volume of aliquot was titrated against 0.1 N NaOH solution using phenolphthalein as an indicator. The results were expressed as per cent anhydrous citric acid (Ranganna, 1986). Total sugar was determined by method of Lane and Eynon (1923). The moisture content of jamun powder was determined using a Contech moisture analyser (model CA-123) at $100^0$C.

**RESULTS AND DISCUSSION**

The data indicate that the bulk density of jamun juice powder was significantly influenced by the maltodextrin levels are presented in Table 3. There was a decrease in the bulk density during storage. During storage, the bulk density was declined throughout the storage period of 90 days. The highest mean bulk density (0.38g/cc) was observed at 0 days, however; it declined to (0.32g/cc) after 90 days of storage. Among the treatments, the highest mean bulk density (0.37g/cc) was observed in the treatment $T_1$ while treatment $T_4$ recorded lowest mean bulk density (0.29g/cc). Moreover, the treatments $T_1$ and $T_2$ were at par with each other.

Similar results were also reported by various workers. Rao (2002), while studying the chemical properties of optimal spray dried orange juice-skim milk observed that the bulk density of the powder was 0.51-0.64 g/ml. whereas the bulk density of tunnel-dried guava powder was 0.69g/$cm^3$ which was higher than spray dried powder as reported by Mahendran (2010). Tuyen *et al.* (2010) noticed 0.72±0.05 and 0.70±0.05 g/ml bulk density of Gac aril powder with 10 and 20 per cent maltodextrin level, respectively. similar reports were also reported by Dhutade (2012) in sapota juice, Khanvilkar (2012) in cashew apple juice, Kshirsagar (2012) in kokum juice, Patade (2013) in coconut milk and Poskar (2013) in aonla juice.

There was a significant effect of different treatments (maltodextrin level) on L* value of jamun juice powder. Among the treatments, the highest mean L* value (48.88) was observed in the treatment $T_4$ which was at par with $T_3$ while the treatment $T_1$ recorded the lowest mean L* value (29.76).As regards storage, a decreasing trend in mean L* value for colour was observed during the storage period of 90 days. The highest mean L* value was observed at 0 days i.e. 45.38, however; the mean L* value for colour decreased to 32.31 after 90 days of storage.It is observed that an increase in maltodextrin level increased the lightness of the powder. As maltodextrin level increased from 10 to 25 per cent, the mean L* value increased from 29.76 to 48.88. Similar observation was also recorded by Jakubezyk *et al*. (2011). The increased L* value powder reveal the white colour of the powder due to oxidation of pigments during spray drying as also reported by Mahendran (2010), Patade (2013) in coconut milk powder.

There was a decreasing order in the a* value noticed during the storage period of 90 days. The highest mean a* value was observed at 0 days i.e. 24.68, which was decline significantly to 20.51 after 90 days of storage. The decline in the a* value for colour during storage was due to the browning reaction similar report was also reported by Patade (2013).

During storage, the b* value exhibited an increasing trend in mean b* value for jamun juice powder colour during the storage period of 90 days and the mean b* value increased to 7.59 after 90 days of storage.

The data with respect to the TSS content of jamun juice powder are given in Table 3 and as regards storage, there was a decreasing trend in TSS value of the product during the storage period of 90 days. The highest mean TSS was observed at 0 days i.e. 98.06 $^0$Brix, however; the mean TSS of powder decreased to 95.43 $^0$Brix after 90 days of storage. There was a significant decline in TSS content during storage this might be due to pickup of the moisture from the atmosphere by the spray dried jamun juice powder which lowered the concentration of total soluble solids of the spray dried jamun juice powder.

Similar results was also observed by Patade (2003). while Costa *et al.* (2009) observed that the dehydrated cashew apple fruit powder had higher (40.38 $^0$Brix) total soluble solids.

The data with respect to the titratable acidity of jamun juice powder are shown in Table 3 and The mean titratable acidity of the jamun juice powder declined significantly during the storage period of 90 days. The highest mean acidity was observed at 0 days i.e. 0.41 per cent, however; the mean titratable acidity decreased to 0.36 per cent after 90 days of storage. A change in titratable acidity was due to the changes in organic acid content in the product. These changes could be influenced by the storage period, enzymatic reactions and microbiological changes during storage. Rao *et al.* (2002) reported that the acidity of orange juice-skim milk powder varied from 0.28 to 0.32 per cent. Costa *et al.* (2009) reported the higher (1.36±0.03%) total titratable acidity in dehydrated cashew apple fruit powder.

The data with respect to the total sugars (%) content of jamun juice powder are given in Table 4 and as regards storage, there was a decreasing trend in total sugars values of jamun juice powder during the storage period of 90 days. The highest mean total sugar was observed at 0 days i.e. 94.63 %, however; during storage of 90 days period the mean total sugars of jamun juice powder decreased to 90.96 %. The lowest total sugars content was observed in the treatment $T_1$ which would be due to low levels of maltodextrin with high content of jamun juice powder particles per unit weight of the spray dried powder. There was a significant decline in total sugars content during storage.

Similar results were also observed by Patade (2003). Murlikrishna *et al.* (1969) reported that guava powder contained 94.10 per cent total sugar.

The data with respect to the moisture content of jamun juice powder are presented in Table 4 and during storage, there was an increase in the moisture content after 90 days of storage. The lowest (1.38) mean moisture was observed at 0 days, however; the mean moisture content increased to 2.40 per cent after 90 days of storage. The gain in moisture might be due to absorption of moisture from the atmosphere by the package as there was higher relative humidity during storage at ambient conditions.

The observations similar to this finding were reported by Babu and Das Gupta, (2005), Mirela *et al.* (2009) in spray dried cashew apple powder**.**

## CONCLUSION

The present experiment revealed that the maltodextrin levels exhibited a significant variation with respect to physical parameters such as bulk density, colour as well as the chemical parameters such as TSS, acidity, total sugar, moisture, content of the jamun juice powder.

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**Table 1: Effect of maltodextrin and tricalcium phosphate on bulk density (g/cc) and L* value for colour of jamun juice powder during storage**

| | Bulk density (g/cc) | | | L* value | | |
|---|---|---|---|---|---|---|
| **Treatments*** | **0 days** | **90 days** | **Mean** | **0 days** | **90 days** | **Mean** |
| **$T_1$** | 0.40 | 0.35 | 0.37 | 34.43 | 24.18 | 29.76 |
| **$T_2$** | 0.40 | 0.35 | 0.37 | 46.03 | 24.62 | 33.70 |
| **$T_3$** | 0.38 | 0.33 | 0.34 | 50.10 | 34.45 | 45.07 |
| **$T_4$** | 0.35 | 0.25 | 0.29 | 50.95 | 46.00 | 48.88 |
| **MEAN** | 0.38 | 0.32 | 0.34 | **45.38** | **32.31** | 39.35 |
| | **SEm±** | **CD at 5%** | | **SEm±** | **CD at 5%** | |
| **Treatment (T)** | 0.004 | 0.012 | | 1.329 | 3.772 | |
| **Storage (S)** | 0.004 | 0.012 | | 1.329 | 3.772 | |
| **Interaction (TXS)** | 0.008 | 0.024 | | 2.658 | 7.544 | |

*Maltodextrin levels (%) - $T_1$-10%, $T_2$-15%, $T_3$-20% and $T_4$-25

**Table 2: Effect of maltodextrin and tricalcium phosphate on a* and b* value for colour of jamun juice powder during storage**

| | a* value | | | b* value | | |
|---|---|---|---|---|---|---|
| **Treatments*** | **0 days** | **90 days** | **Mean** | **0 days** | **90 days** | **Mean** |
| **$T_1$** | 28.08 | 24.30 | 25.83 | 1.93 | 6.98 | 4.16 |
| **$T_2$** | 24.15 | 19.73 | 22.78 | 1.98 | 7.48 | 5.01 |
| **$T_3$** | 24.15 | 19.63 | 22.48 | 2.80 | 7.73 | 5.56 |
| **$T_4$** | 22.33 | 18.38 | 20.51 | 4.00 | 8.18 | 6.09 |
| **MEAN** | 24.68 | 20.51 | 22.85 | 2.68 | 7.59 | 5.20 |
| | **SEm±** | **CD at 5%** | | **SEm±** | **CD at 5%** | |
| **Treatment (T)** | 0.417 | 1.183 | | 0.467 | 1.330 | |
| **Storage (S)** | 0.417 | 1.183 | | 0.467 | 1.330 | |
| **Interaction (TXS)** | 0.834 | NS | | 0.935 | 2.660 | |

*Maltodextrin levels (%) - $T_1$-10%, $T_2$-15%, $T_3$-20% and $T_4$-25

**Table 3: Effect of maltodextrin and tricalcium phosphate on TSS ($^0$Brix) and Acidity (%) of jamun juice powder during storage**

| | TSS ($^0$Brix) | | | Acidity (%) | | |
|---|---|---|---|---|---|---|
| **Treatments*** | **0 days** | **90 days** | **MEAN** | **0 days** | **90 days** | **Mean** |
| **$T_1$** | 95.68 | 92.93 | 94.06 | 0.49 | 0.46 | 0.47 |
| **$T_2$** | 98.65 | 95.30 | 97.02 | 0.40 | 0.36 | 0.38 |
| **$T_3$** | 98.75 | 96.25 | 97.56 | 0.37 | 0.31 | 0.35 |
| **$T_4$** | 99.15 | 97.25 | 98.17 | 0.37 | 0.30 | 0.33 |
| **MEAN** | 98.06 | 95.43 | 96.70 | 0.41 | 0.36 | 0.38 |
| | **SEm±** | **CD at 5%** | | **SEm±** | **CD at 5%** | |
| **Treatment (T)** | 0.310 | 0.882 | | 0.009 | 0.027 | |
| **Storage (S)** | 0.310 | 0.882 | | 0.009 | 0.027 | |
| **Interaction (TXS)** | 0.620 | 1.765 | | 0.019 | 0.055 | |

*Maltodextrin levels (%) - $T_1$-10%, $T_2$-15%, $T_3$-20% and $T_4$-25

**TABLE 4: Effect of maltodextrin and tricalcium phosphate on Total sugar (%) and Moisture (%) of jamun juice powder during storage**

| | Total sugar (%) | | | Moisture (%) | | |
|---|---|---|---|---|---|---|
| **Treatments*** | **0 days** | **90 days** | **MEAN** | **0 days** | **90 days** | **Mean** |
| **$T_1$** | 91.26 | 87.72 | 89.60 | 1.63 | 2.95 | 2.17 |
| **$T_2$** | 93.84 | 90.28 | 91.91 | 1.56 | 2.35 | 1.85 |
| **$T_3$** | 95.84 | 92.15 | 93.78 | 1.36 | 2.25 | 1.69 |
| **$T_4$** | 97.57 | 93.69 | 95.49 | 0.96 | 2.05 | 1.44 |
| **MEAN** | 94.63 | 90.96 | 92.69 | 1.38 | 2.40 | 1.79 |
| | **SEm±** | **CD at 5%** | | **SEm±** | **CD at 5%** | |
| **Treatment (T)** | 0.190 | 0.542 | | 0.012 | 0.034 | |
| **Storage (S)** | 0.190 | 0.542 | | 0.012 | 0.034 | |
| **Interaction (TXS)** | 0.381 | 1.084 | | 0.024 | 0.068 | |

*Maltodextrin levels (%) - $T_1$-10%, $T_2$-15%, $T_3$-20% and $T_4$-25

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