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Development of chocolate center filled with lemon marmalade and its sensory studies

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Abstract
Chocolate is a luxury food that evokes a range of stimuli which activate pleasure during its consumption. It is not only popular among children, but also consumed by youth and old age people. Considering the popularity of chocolates, the present project was taken up to study the development of the center filled chocolate with lemon marmalade. Chocolate center filled with lemon marmalade product was developed and stored at 7°C for 10months and observe the sensory properties. For sensory study, chocolate sample was wrapped in aluminum foil and stored at refrigeration temperature (7°C) for 10months.During storage sensory scores of color and appearance, body and texture, flavor and overall acceptability of chocolate center filled with lemon marmalade were unchanged.

Keywords: chocolate, lemons, marmalade, center fillings

1. Introduction
Cocoa" is a corrupted word for cacao, which is taken directly from the Mayan and Aztec languages. Chocolate is derived from cocoa beans, central to the fruit of the tree Theobroma cacao (Figure 1). Theobroma (from the Greek for "food of the gods") are of the family Sterculiaceae. They comprise two principal types: Criollo, constituting about 5% of the world's cocoa production, and the more common Forastero, which has smaller, flatter, purple beans. A third variety, Trinitario (a more disease-resistant hybrid of Criollo and Forastero), is regarded as a flavour bean. Fowler MS (1999) (Ref-1)

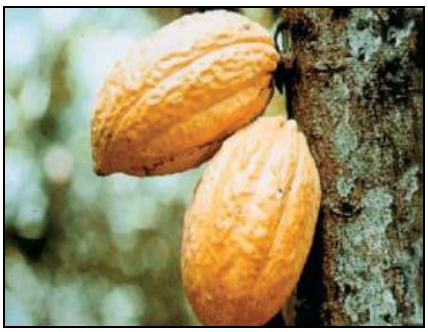

Fig 1.1: Typical cocoa tree with pods

Cocoa and cocoa-containing foods, such as dark chocolate, represent a very rich source of flavonoids as they provide a higher content of flavonoids per serving than red wine or tea Lee KW (2003),(Ref-2)
Chocolate is usually consumed in pleasant situations; many people find it delicious because chocolate has a characteristic texture, dissolves in the mouth, and has a nice aroma and a slightly bitter sweet taste. From a nutritional standpoint, chocolate is energy-rich and has a high content of fat (saturated and to a lesser extent mono-unsaturated fat) and sugar. It also containsminerals (potassium, phosphorus, magnesium, and zinc), flavonols, biogenic amines (tyramine and pheny lethy lamine), methylxanthines (caffeine and the obromine), and cannabinoid-like fatty acids. (Bruinsma K, Taren D, 1999) [3] (Ref-3)
Lemon (Citrus Limon from Rutaceae) is one of the citrus fruits, most commonly grown tree fruit in the world. Citrus fruits are the top not only in total production, but also in economic value. Citrus fruits, which consist of two parts namely the peels (rind skin) and pulp. These two parts are easily separated from each other with the pulp serving as the edible parts of the fruit while the peels as a good source of pectin (Me Gready, 1996) [9]. (Ref 4-8)
jams and jellies may have originated as an early effort to preserve fruit for consumption in the off-season. As sugar for their manufacture became more affordable, the popularity and availability of these fruit products increased (Anon., 1983). Jellies, jams, preserves, and marmalades are primarily distinguished by the form in which their fruit component is incorporated. In jellies, only strained fruit juice is used, while jams are made with crushed or ground fruit material. Preserves are made with whole fruit (if sufficiently small) or large pieces of fruit (Ahmed, 1981).

2. Material & Methods
Crystal sugar (sucrose) was purchased from M/s. Annapurna Traders Humnabad Dist. Bidar, The sugar had a moisture of 0.2% with a particle size ranged from 0.2 to 0.75 mm. Cocoa powder had a fineness 98.30(by 100 Mesh) Supplied from LCCL Telangana, Skimmed milk powder of 0.66% fat was supplied from Shreeji Foods Pvt Ltd, Secunerabad. vanillin was supplied from IMCD India Private Limited Mumbai, cocoa butter (Non- lauric specialty oil based on fractionated vegetable fat) was obtained from Lotus Chocolate Company Limited, Telangana, Lecithin (semi liquid) which had a

viscosity 80 -120 poise was obtained from Shreenidhi Oils & Foods Ingredients Pvt. Ltd, Madya Pradesh, while P.G.P.R (polyglycerol polyricinoleate) numerical references – E 476 was obtained from Lasenor India Pvt Ltd, Nagpur.

2.1.1 Process flow chart for the Lemon Marmalade

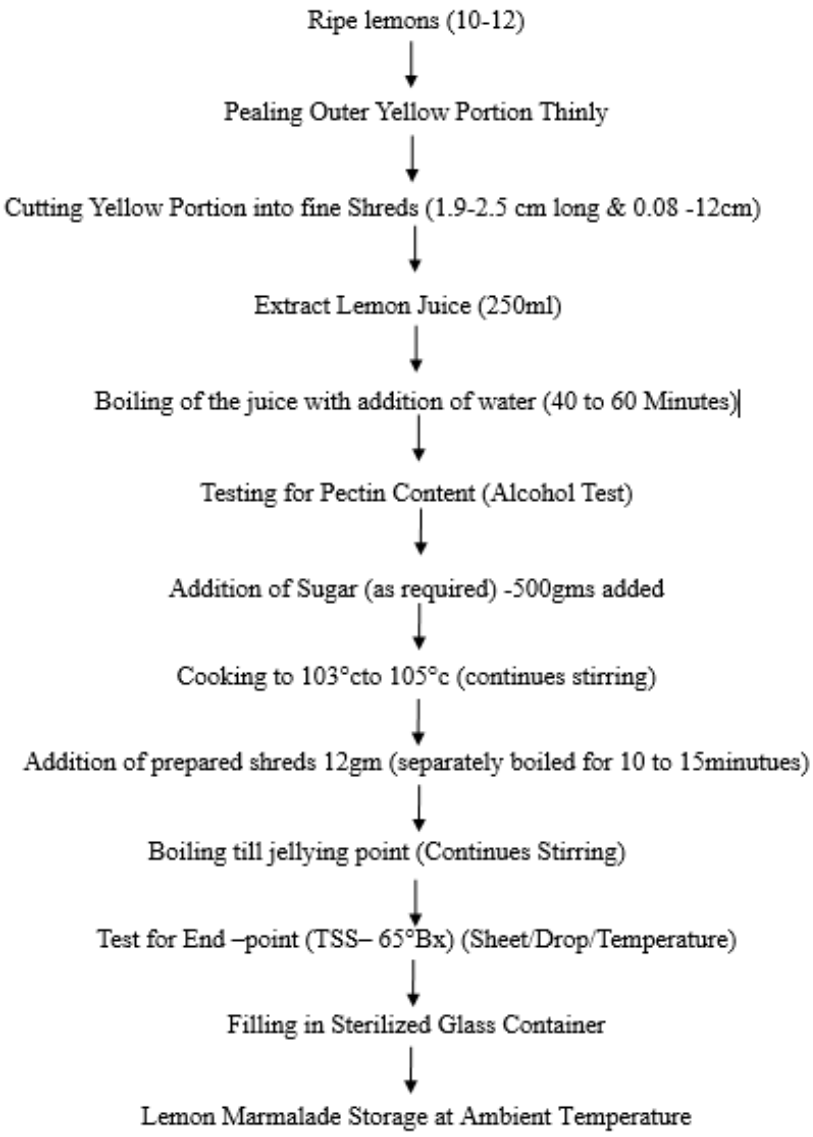

Fig 2

Fig 3: Lemon Marmalade

2.1.2 Process flow chart for white /dark chocolate

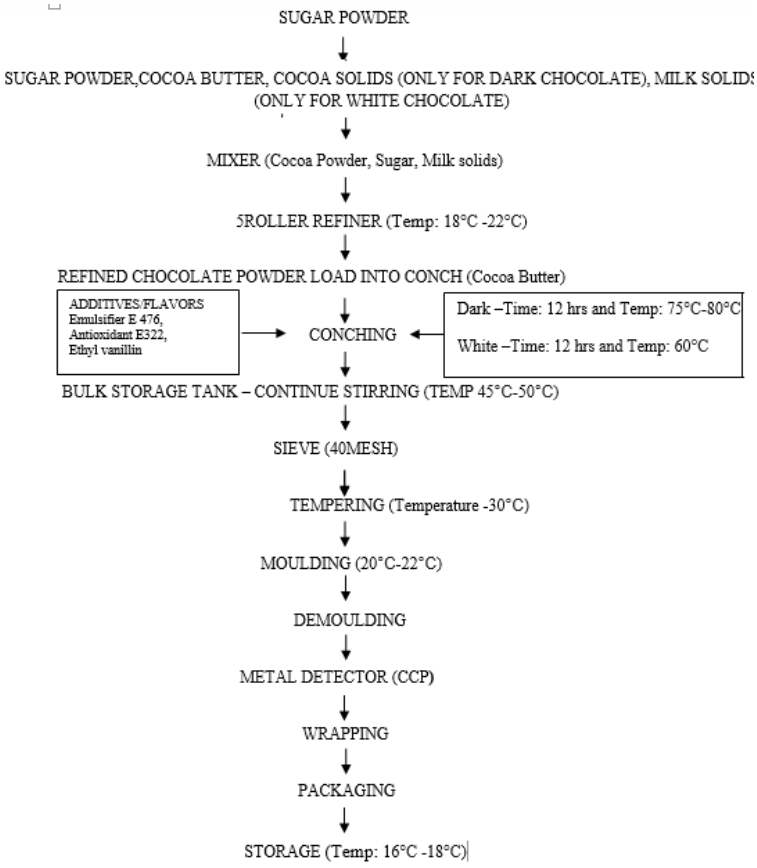

Fig 4

2.1.3. Process flow chart for developing Center Filled Chocolate with Lemon Marmalade

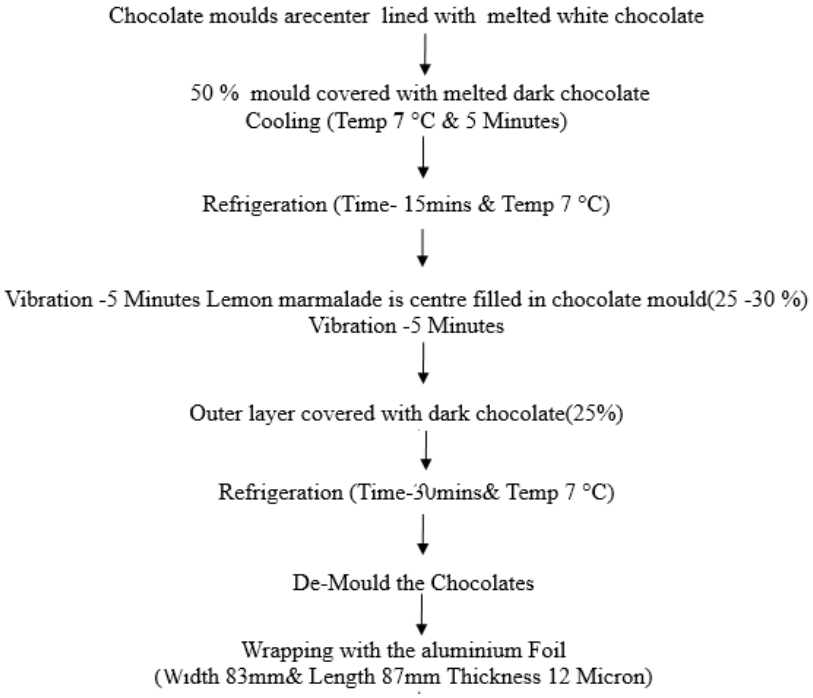

Fig 5

Fig 6: lemon marmalade center filled chocolates

3. Results & Discussion

Chocolate samples were evaluated for sensory characteristics like color, texture, flavor, using 9-point Hedonic scale. Sensory evaluation of the chocolate was performed by a panel of 25 untrained and 8 trained judges from the Lotus Chocolate Company Llimited, Nastipur village, Hathnoor mandal Sangareddy dist. Selection criteria were availability of the assessors, interest to participate in the study, the absence of aversions, allergies, or intolerance against chocolate, normal perception abilities, and no chocolate craving.

3.1 Center filled chocolate with lemon marmalade table for sensory characteristics results

Table 1

	Appearance	Color	Texture	Flavor	Taste	Overall acceptability
0M	8.1	7.6	7.6	7.4	7.7	7.4
1M	7.8	7.5	7.6	7.3	7.5	7.3
2M	8	7.7	7.4	8	7.6	7.6
3M	8.1	7.5	7.6	7.3	7.6	7.4
4M	7.9	7.6	7.7	7.0	7.4	7.2
5M	8.1	7.4	7.5	7.9	7.7	7.6
6M	7.8	7.4	7.6	7.3	7.3	7.5
7M	7.9	7.6	7.3	7.6	7.8	7.3
8M	8.1	7.2	7.7	7.3	7.6	7.4
9M	8.0	7.7	7.5	7.2	7.5	7.4
10M	7.8	7.6	7.2	7.4	7.7	7.3

3.1 Effect on color and appearance

Color, glossiness, shape of chocolate, and its surface texture are among the basic features characterizing the look and decisive influence on consumer interest about a given product (Simonot and Elias, 2002). Color perception may be largely influenced. These attributes result from complex interactions of the incident light, optical properties, and human perception (Afoakwa, 2010).

Color and appearance score slightly varied in the chocolate sample stored at temperature 7°C from 8.1 to 8.0 up to 9 Months (Table 3.1) while no visible color change was observed in samples stored at 7°C up to 9Months and there after a slight color change was encountered. Score of chocolate samples stored at 10°C decreased from 8.8 to 7.6. Similar results were reported by during storage of chocolate at temperatures 11, 20 and 25°C. (Diwakar Mishra *et al*., (2013)

3.2 Effect on texture

Texture score of chocolate samples slightly decreased during storage at temperature 7°C (Fig.7). Score of sample decreased from 7.6 to 7.2 at 7°C due to slight decrease in hardness.

3.3Effect on flavor

The change in flavor scores were measured by the semi trained sensory panel using 9 point hedonic scale (Fig. 7). No change in the score was observed in chocolate up to 10Months storage at temperature 7°C.

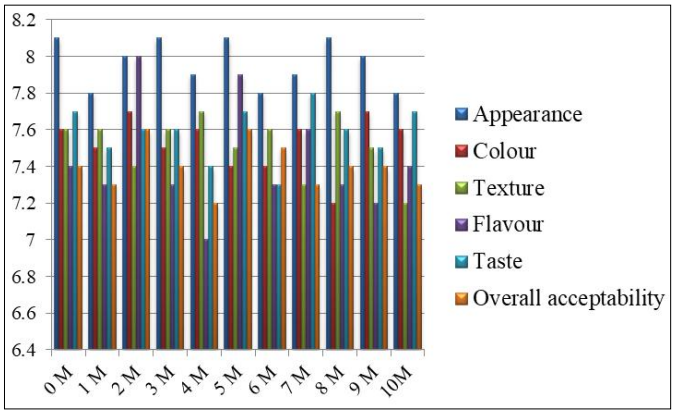

Fig 7: Sensory characteristics results center filled chocolate with lemon marmalade

3.4 Effect on overall acceptability

No change in overall acceptability was observed in chocolate at temperature 7 $^{\circ}C$ up to 10 months storage. Similar results were reported by the Diwakar Mishra *et al*., (2013) when storedat temperature 2^{c}.

4. Conclusions

It was concluded that characteristics of center filled chocolate with lemon marmalade like color, appearance and texture, flavor, overall acceptability were acceptable up to 9 months of storage at 7°C temperature taken for study. Chocolate stored at low temperature (7°C) was found to be best. Jams and jellies may have originated as an early effort to preserve fruit for consumption in the off-season. As sugar for their manufacture became more affordable, the popularity and availability of these lemon fruit products will increase. Generally we can have taste two types of tastes exist inchocolates i.e, sweet and Bitter. One can feel sour taste in candy chocolate, but cannot feel in general chocolates. But the trailed product will give mixed taste of both sweet and sour. The use of fruit bases made easier the development of fillings with low cost and longer shelf life. Formulations of fruit bases had good stability and could be used by industries for new product development in different filling bases, not only for chocolate fillings.

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