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Effect of Cashew Nut and Jaggery on Textural properties of *kajukatli*

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ABSTRACT: In the present study RSM software was used for optimization of the levels of different variables. Three levels of each of the two variables where attempted *viz.*, Cashew nut 40%, 50% and 60% and jaggery 20%, 30% and 40% on the basis of preliminary trials. The software suggested 13 formulations of above two variables. This software suggests only one formulation based on analysis of sensory data of 13 formulations. Only one formulation comparing 54.93% cashew nut and 28.28% jaggery was suggested by the design expert software for further studies. The optimized formulation was used in comparison with the market *kajukatli* samples for sensory, physico-chemical, textural profile study and storage study. In that study, optimized sample was compared with market sample. The level of cashew nut and jaggery did affect the textural properties of *kajukatli* significantly. The mean value of hardness of optimized and market samples were 78.80, 182.27, 139.86, 179.32 and 142.83 N in O_1, M_1, M_2, M_3 and M_4 respectively, cohesiveness value were 0.239, 0.170, 0.184, 0.204 and 0.152 in O_1, M_1, M_2, M_3 and M_4 respectively, adhesiveness value were -0.739, -0.631, -0.503, -1.122 and -0.182 kg.sec in O_1, M_1, M_2, M_3 and M_4 respectively, springiness value were 0.341, 0.428, 0.249, 0.415 and 0.215 mm in O_1, M_1, M_2, M_3 and M_4 respectively, gumminess value were 1.922, 3.164, 2.622, 3.720 and 2.216 N.mm in O_1, M_1, M_2, M_3 and M_4, respectively chewiness value were 0.654, 1.353, 0.652, 1.542 and 0.475 N.mm in O_1, M_1, M_2, M_3 and M_4 respectively.

Keywords: *Kajukatli*, cashew nut, jaggery, textural study, Optimized and market sample.

INTRODUCTION

India is the world's largest milk producer with an annual milk production of 198.4 MT million metric tonnes in year 2019-2020. The annual growth rate of India 6.41 per cent during 2019-2020 with per capita availability is 407gm/day, (NDDB statistics, 2019-20). Buffalo milk is considered more superior than cow milk due to its higher fat, SNF and protein content and hence this milk used for preparation of *khoa* and *khoa* based sweets. *Khoa* prepared from buffalo milk gives soft, loose body and smooth texture to final product. *Khoa* contains higher milk solids, approximately four fold concentration, therefore the food and nutritive value of *khoa* is very high. Among the Indigenous dairy products, khoa and khoa based milk products are highly popular in India, because of their delicious taste and high nutritional value. Khoa based milk sweets provide a good means of conserving and preserving surplus milk solids. Khoa is the main base for the production of sweet meat products. Sweets prepared from khoa are basically *gulabjamun*, *kalakand*, *burfi*, *peda*, *kajukatli* etc. (Londhe and Pal 2007).

Kajukatli is one of the nut based sweet manufactured and sold in large quantities in India. It is traditionally consumed during the diwali festival, but it is also an ideal gift for friends and family on special occasions. Dried fruits can be added to the dessert in order to enhance its flavours. In Indian culture, it is believed that by consuming *kajukatli*, one brings good luck and prosperity to his home. Among various types of Indian sweets, *kajukatli* is one of the popular sweets in India and other developed as well as developing countries. *Kajukatli* is one of the most popular Indian sweet because of its delicate texture, good flavor and excellent mouthfeel.

Jaggery contains proteins, minerals and vitamins. It is also a potent source of iron and has higher iron and copper contents than refined sugar. It is also a superior product in the category of natural sweeteners in terms of the vitamin content. It is an energy food that is said to purify blood, regulate liver function and keep the body healthy. (FSSAI, 2018). Further, its use in many herbal and traditional medicines. In ayurvedic way of medicine, it is used as medicine, blood purifier and base

material for syrups. Jaggery contains trace amounts of fats, iron, calcium and phosphates which are absent in white sugar. It also possesses medicinal properties (Abhai & Singh 2020).

Cashew nut is one of the most delicious and nutritious nuts all over the world. Cashew nut is highly nutritious and concentrated form of food providing a substantial amount of energy (Manay *et al.*, 1987). Cashew nut contains rich in protein, healthy fats and antioxidants such as polyphenols. Cashew nuts are good source of magnesium, which plays an important role in enzymatic reactions within the body. Nuts as a part in maintenance of collagen and elastin, major structural components of our bodies (Vyavahare *et al.*, 2020).

MATERIALS AND METHOD

The whole, fresh, clean buffalo milk require for research work was collected from the buffalo unit maintained at Department of Animal Husbandry and Dairy Science College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani.

The fresh buffalo milk was standardized at 6 per cent fat level for preparation of *kajukatli.* For the preparation of kajukatli dried cashew nuts and jaggery were purchased from local market of parbhani.

Texture profile analyzer: The textural properties i.e. hardness, cohesiveness, adhesiveness, springiness, chewiness, gumminess, etc. was determined with the help of TA.XT plus Texture Profile Analyzer available at Niche Area Laboratory, College of Food Technology, VNMKV, Parbhani.

***Preparation of kajukatli*:** The procedure for manufacture of kajukatli was used from Sharma *et al.* (2017) with slight modifications:

Receiving of milk
↓
Filtration/Clarification (35-40^{0}C)
↓
Standardization (6% fat)
↓
Heating milk in open pan with continuous stirring and scrapping while boiling till pasty consistency
↓
Khoa (pat) formation stage
↓
Addition of jaggery as per level
↓
Addition of cashew nut powder as per level
↓
Continuous stirring on low flame upto solid mass stage
↓
Spreading into stainless steel tray for cooling
↓
Rolling and sheeting to 5mm thickness
↓
Cutting with knife
↓
Packaging
↓
Storage

Flow-chart for preparation of *kajukatli* by addition of jaggery and cashew nut powder

Treatment Details. For the preparation of *kajukatli* from buffalo milk with two factors i.e. cashew nut and jaggery are going to be used. The following maximum and minimum value of jaggery and cashew nuts was filled in the RSM software for study.

Optimization of levels of Cashew nut and Jaggery on *khoa* basis using RSM

Standard Order	Factor 1 Cashew nut (%)	Factor 2 Jaggery (%)
1	40.00	20.00
2	64.14	30.00
3	50.00	44.14
4	60.00	40.00
5	50.00	30.00
6	50.00	30.00
7	60.00	20.00
8	50.00	15.86
9	50.00	30.00
10	50.00	30.00
11	40.00	40.00
12	50.00	30.00
13	35.86	30.00

The levels of these factors were two and experimental design was setup with experimental points having 5 replicates at the center. The center points of the experimental design were defined as 50% cashew nut and 30% jaggery.

Comparison of textural profile of optimized and market *kajukatli.* The quality of product is monitored not only by the sensory properties but also by their rheological/textural profile. The instrumental method of texture assessment aims at quantifying objectively the textural characteristics to the maximum extent possible.

The textural characteristics of *kajukatli* are greatly influenced by its composition and manufacturing practices/parameters followed type of *kajukatli* etc. The textural profile of *kajukatli* was measured in terms of hardness, cohesiveness, springiness adhesiveness, gumminess and chewiness they were delineated in this section. Description of values obtained by textural analysis and the effect of varying level of cashew nut and jaggery on rheological properties of optimized and market *kajukatli* samples were tabulated in Table 1.

Table 1: Significance of differences in mean values of textural profile between optimized and market *kajukatli*.

Parameter	Optimized	M_1	M_2	M_3	M_4	CD at 5%
Hardness (N)	78.80±1.76^c	182.27±3.39^a	139.86± 2.49^b	179.32±1.78^a	142.83±1.58^b	4.010
Adhesiveness (kg.sec)	-0.739±0.040^b	-0.631±0.029^c	-0.503±0.032^d	-1.122±0.024^a	-0.182±0.035^e	0.057
Cohesiveness	0.239±0.032^a	0.170±0.050^b	0.184±0.057^{ab}	0.204±0.053^{ab}	0.152±0.054^b	0.058
Chewiness (N.mm)	0.654±0.042^c	1.353±0.053^b	0.654±0.040^c	1.542±0.029^a	0.475±0.045^d	0.074
Springiness (mm)	0.341±0.044^b	0.428±0.042^a	0.249±0.036^c	0.415±0.046^a	0.215±0.028^c	0.050
Gumminess (N.mm)	1.922±0.036^e	3.164±0.039^b	2.622±0.046^c	3.720±0.085^a	2.216±0.038^d	0.091

Values in a row with different superscripts are significantly different at p<0.05

1. Hardness (N). From the above Table 1 it was observed that the mean of hardness value of optimized and market samples was 78.80, 182.27, 139.86, 179.32 and 142.83 N in O_1, M_1, M_2, M_3 and M_4 respectively. The hardness value of optimized sample O_1 of *kajukatli* was significantly lower (P<0.05) than other markets samples; There was significant difference in *kajukatli* between optimize and market samples. It was also observed that the lowest a value was observed in optimized samples O_1 and the highest in M_1.

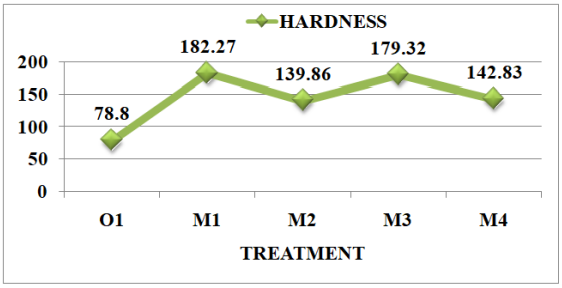
The optimized *kajukatli* samples had significantly lower hardness due to addition of jaggery. The increase in hardness of market *kajukatli* as compare to optimized *kajukatli* because of addition of sugar. Patel *et al.* (1990) also reported that the moisture content of peda had direct relationship to hardness.

The decrease in hardness of optimized *kajukatli* as compare to market *kajukatli* because of addition of jaggery and khoa. The moisture content in the product increases, the hardness was decreased.

The above results for hardness score are comparable with the finding of following research workers.

Satav (2014) studied on textural properties of walnut burfi. It reported that the hardness of walnut burfi increases as per increasing level of walnut in burfi ranged from 0.462 to 1.193 kg.

Parmar & Sharma (2016) studied on market kaju katli samples collected from different cities. It was reported that the hardness of kajukatli ranging from 107.64 to 374.10 N. These are variation in hardness due to addition of sugar. Sugar contain amount of moisture as compared to jaggery.



2. Cohesiveness. Cohesiveness refers to the extent to which a material can be deformed before it ruptures.

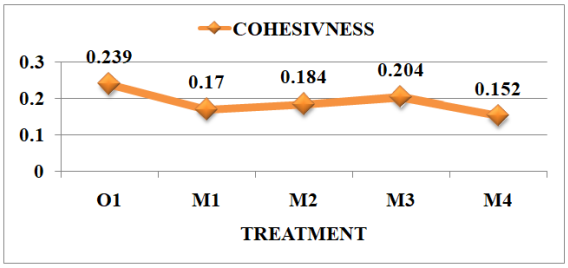
From the above Table 1, it was observed that the mean of cohesiveness value of optimized and market samples was 0.239, 0.170, 0.184, 0.204 and 0.152 in O_1, M_1, M_2, M_3 and M_4 respectively. The cohesiveness value of optimized sample O_1 of *kajukatli* was significantly superior (P<0.05) over other markets samples; There was significant difference in *kajukatli* between optimize and market samples. It was also observed that the lowest value was observed in market samples M_4 and the highest in O_1.

The present study indicates that there was increase in cohesiveness due to the effect of jaggery and cashew nut on moisture content in optimized sample as compare to market sample. The maximum cohesiveness was found in optimized *kajukatli* than market *kajukatli* because of addition of cashew nut, khoa and jaggery.

The above results for cohesiveness score are comparable with the finding of following research workers.

Parmar & Sharma (2016) observed the stickiness of different market kajukatli sample ranged between 0.109 to 0.329 Nmm. The variation in stickiness occurs due to variation in addition of sugar.

Jadhav (2021) Observed that the increases in cohesiveness due to increases in moisture content. It stated that the cohesiveness of almond katli decreases from T_1 (1.336) to T_3 (1.056). The obtained results represent that decrease in moisture percent in almond katli because of addition of jaggery decreases cohesiveness.



3. Adhesiveness. Adhesiveness which is force necessary to remove the material that adhere to the mouth during eating.

Adhesiveness = Negative area in the graph

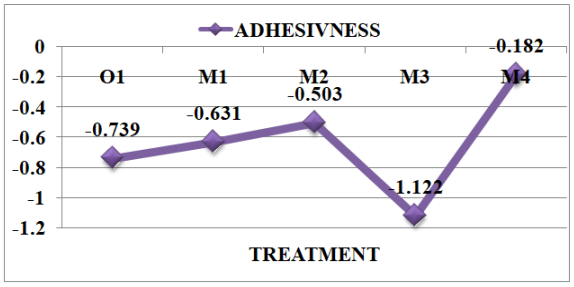
From the above Table 1, it was observed that the mean of adhesiveness value of optimized and market samples

were -0.739, -0.631, -0.503, -1.122 and -0.182 kg.sec in O_1, M_1, M_2, M_3 and M_4 respectively. There was significant difference in *kajukatli* between optimized and market samples. It was also observed that the lowest value was observed in market samples M_4 and the highest in M_3.

The above results for adhesiveness score are comparable with the finding of following research workers.

Rasane *et al*. (2012) stated that the variation in adhesiveness of market samples of *burfi* may be due to variation in sugar content. Adhesiveness may be vary from different samples collected from different places.

Jadhav (2021) started that the average value of adhesiveness of almond katli prepared by using jaggery. It was reported that the mean value of adhesiveness 0.004 to 0.001. These value decreasing in order because of increasing level of jaggery. It occurs less adhesiveness in almond katli as compared to control sample.



4. Springiness. Springiness is the rate and extend to which deform material goes back to its deformed condition after the force is removed.

From the above Table 1 it was observed that the mean of springiness value of optimized and market samples were 0.341, 0.428, 0.249, 0.415 and 0.215 mm in O_1, M_1, M_2, M_3 and M_4 respectively. The springiness value of market sample M_1 of *kajukatli* was significantly superior ($P<0.05$) over optimize and other market samples. There was significant difference in *kajukatli* between optimize and market samples. It was also observed that the lowest value was observed in M_4 sample and the highest in M_1.

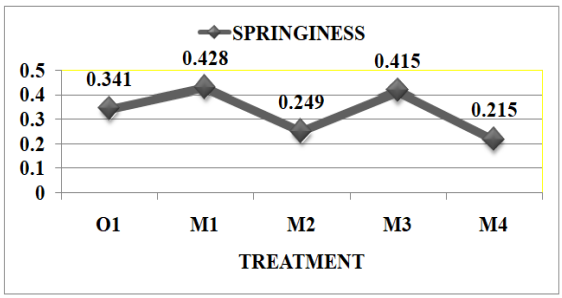
The above results for springiness score are comparable with the finding of following research workers.

Tanuja *et al.* (2017) studied springiness ranges from 0.39 to 0.84 on in apple pomance incorporated burfi.

Jadhav (2021) reported the springiness of almond katli ranging from 1.114 to 1.047. The level of jaggery increases the springiness of almond katli decreases because jaggery contains moisture.

Patil (2021) observed that the springiness varied from 1.50 to 1.43 for powder burfi. It was influenced by maintaining khoa constant.

5. Gumminess. Gumminess is the energy required to masticate a solid food product to make it ready for swallowing. The optimized *kajukatli* prepared from addition of cashew nut and jaggery had significantly higher gumminess as compare to market *kajukatli.*

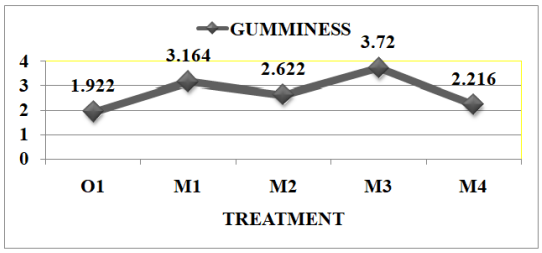


From the above Table 1, it was observed that the mean of gumminess value of optimized and market samples were 1.922, 3.164, 2.622, 3.720 and 2.216 N.mm in O_1, M_1, M_2, M_3 and M_4, respectively. The gumminess value of optimized sample O_1 of *kajukatli* was significantly inferior ($P<0.05$) over other markets samples; There was significant difference in *kajukatli* between optimize and market samples. It was also observed that the lowest value was observed in O_1 optimized sample and the highest in M_3. The gumminess of optimized sample was lowest because hardness and cohesiveness of optimized sample was lower. Gumminess is the multiplication of hardness and cohesiveness.

The above results for gumminess score are comparable with the finding of following research workers.

Jadhav (2021) started that the gumminess of almond katli ranged from 1.92 to 2.80. It was observed that the level of jaggary increases the hardness and cohesiveness decreases and thus impact on gumminess also decreases.

Patil (2021) noticed that the level of black gram powder increases, there was increases in gumminess of burfi. It was Ranged from 1.35 to 2.43.



6. Chewiness. Energy required for masticating a solid food product to make it ready for swallowing. The optimized *kajukatli* prepared from cashew nut and jaggery had significantly higher chewiness as compare to market *kajukatli.*

It was observed that the mean of chewiness value of optimized and market samples were 0.654, 1.353, 0.652, 1.542 and 0.475 N.mm in O_1, M_1, M_2, M_3 and M_4 respectively. The chewiness value of market sample M_3 of *kajukatli* was significantly superior ($P<0.05$) over optimize and other market samples; It was also observed that the lowest value was observed in M_4 sample and the highest in M_3.

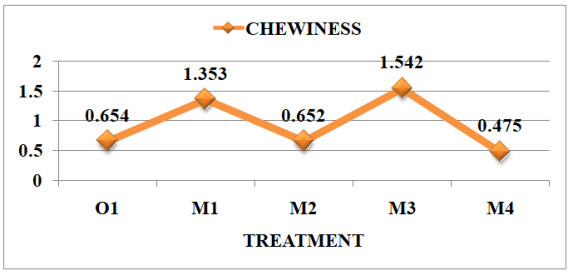
Chewiness (g) = Gumminess x Springiness (H X A2/A1) X D1

The above results for chewiness score are comparable with the finding of following research workers.

Satav (2014) studied on textural properties of walnut *burfi*. It revealed that chewiness goes on increasing

from 0.805 to 1.855 when addition of walnut powder in burfi.

Patil (2021) started that chewiness also increased with added black gram powder. It was increased from 2.037 to 3.48.



CONCLUSIONS

1. The results of present investigation, it could be concluded that the kajukatli prepared using 54.93% cashew nut and 28.28% jaggery.
2. The optimized kajukatli prepared by addition of cashew nut and jaggery was significantly better as compared to market sample.
3. Textural analysis of product revealed that addition of cashew nut and jaggery in *kajukatli* progressive decreased hardness, gumminess, adhesiveness and increased cohesiveness over the market *kajukatli* sample.

REFERENCES

Abhai, K. and Singh, S., (2020). The Benefit of Indian jaggery over sugar on human health. Interdisciplinary school of life science, Banaras Hindu University, Varanasi, India.

FSSAI (2018). The Food Safety and Standards Act. Introduction to Food and Food Processing Vol. 1. In: A training manual for food safety regulators.

Jadhav, J. S. (2021). Studies of preparation of Almond Katli using Jaggery as sweetening agent. *M.Sc.* thesis submitted to Vasantrao Naik Marathwada Krishi Vidyapeeth , Parbhani (MS).

Londhe, G. and Pal, D. (2007). Development in shelf life extension of *khoa* based sweets- an overview. *Indian Journal Dairy and Biosci., 18*, 1-9.

Manay, N., and M. Shadakshraswamy (1987). Facts and principles. Willey eastern Ltd. New Delhi.

NDDB statistics, (2019). Milk and Milk Production in India.*www.nddbstatistics.com*, Gujrat.

Parmar, A. F. & Sharma, A. K. (2016). A study on commercial *kajukatli* preparations and standardization. *Agric International*, *3*(02), 61-68.

Parmar and Sharma (2016). Studies on commercial kajukatli preparations and standardization. Anand Agricultural University Anand, Gujarat India. *Agric International*, *3*(2), 61-68.

Patil, S. P. (2021). Effect of physico-chemical and Texture properties on Black Gram flour Burfi. *International Journal of Current Microbiology and Applied Science, 11*(02), 288-293.

Rasane, Arvind and Alok Jha (2012). Sensory and texture profile analysis of burfi samples manufactured in Varanasi. *Journal Dairying, Foods & H.S., 31*(3), 168 –172.

Satav, Y. L. (2014). Studies on preparation of *burfi* blended with walnut powder. M.Sc. (Agri.) *thesis* submitted to VNMKV, Parbhani.

Satav, Y. L., Narwade, S. G., Kadam, R. P. & Syed, I. H. (2014). Effect of walnut powder incorporation on seasonal, nutritional and textural quality profile of burfi. *The Asian Journal of Animal Science, 9*(2), 129-133.

Sharma, A. K., Brahmbhatt, J. V., & Patel, A. M. (2017). Storage study of standardized Kajukatli. *IJSART*, *3*(5), 406-409.

Tanuja, P., Pathak, V. & Goswami, M. (2017). Development and quality evaluation of apple pomace incorporated Burfi. *Indian Journal of Dairy Science, 70*, 162-166.

Vyavahare, R. D, Khupase, P., Kashid P., Kakade, V. S. and Otari, K. V. (2020). Health Benefit of a handful of cashew Nuts to prevent Different Disorders. *Journal of pharmaceutical quality Assurance and Quality control*, *2*(1), 10-18.

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