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Effect of Moisture and Emulsifying Salt Concentration on Sensory Attributes of Reconstituted Dried Mozzarella Cheese Aspizza Topping

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A B S T R A C T

The present investigation was carried out to observe the effect of moisture and emulsifying salt concentration on sensory attributes of reconstituted dried mozzarella cheese as pizza topping. For this purpose, Mozzarella cheese having optimized composition is dried in vacuum tray dryer below 5% moisture content. Further, dried Mozzarella cheese samples were reconstituted with pasteurized water and added with tri-sodium citrate (TSC) in combination with di-sodium hydrogen orthophosphate (DSHP) emulsifying salt along with common salt at fixed rate. The dried Mozzarella cheese samples were reconstituted with five different levels of moisture 40, 45, 50, 55 and 60 per cent. Similarly, five different levels of emulsifying salt concentration 0, 0.5, 1.0, 1.5 and 2.0 per cent and examined for baking trials after applying them as Pizza topping. It was reported that, 60 per cent of moisture in the final blend is the best moisture level to be used as Pizza topping. On the other hand, the mixture of emulsifying salts at the rate of 1.5 per cent (w/w) yielded a reconstituted dried Mozzarella cheese having superior functional properties for use on pizza such as melt, stretch, flavour as well as chewiness and hence the rate was chosen over other salt levels studied.

Introduction

The world cheese production was 16.5 million tonnes in 2002 and has been increasing at an average annual rate of 3.0 per cent over the past 2 decades. Europe, with a cheese production of 8.7 million tonnes per annum (~ 53.0 per cent of world production) is the largest producing region, whereas North and Central America produces about 28.0 per cent of world cheese (Fox and McSweeney, 2004). Over 75.0 per cent of all Mozzarella produced in the US was used for pizza (Alvarez, 1985). These figures also show that cheese is becoming a popular item in the menu of all relatively well-off families throughout the world. It has moved from being an elite product to more comfortable environs.

People from all walks of life are buying it and experimenting with its different flavours. The dramatic growth in the consumption of pizza cheese in recent years highlights the importance of functionality as a major driving force in augmenting global cheese consumption.

Innovations in type of cheese (pizza) that improve pizza's look, flavour and performance are giving pizza makers new ways to satisfy consumer tastes. If the end user of cheese is seeking a specific shred, melt, stretch, blister, colour, flavour or texture, cheese manufacturers have the challenge of customizing their product to fit the application. Today we are observing the evolution of cheese, created specifically for the needs of pizza-making. That gives pizza makers lots of options for creating pizza that pleases consumers. For consumers, cheese is a favourite pizza ingredient because of its great taste, texture and mouth feel. Pizza makers value cheese because cheese brings to pizza the triple play of performance, flavour and nutrition. Pizza's increasing popularity and growing penetration into today's entire market segments offer a wealth of new opportunities to incorporate original flavour concepts, unusual ingredients and more-convenient forms (Fricke–stallsmith, 2003).

Pizza can be used for many applications throughout the foodservice industry. For a breakfast pizza, for example, yeast dough might be topped with scrambled eggs, crumbled bacon, shredded Cheddar cheese and chopped green onion. For a dessert pizza, a lightly sweetened crust can be topped with Mascarpone cheese and fresh fruit, seasoned with cinnamon and sugar and drizzled with melted chocolate. Also providing pizza components at the foodservice level is now a popular approach, e.g. dough are pre-made or mixed, sauces are provided, and toppings are precut, precooked and ready to apply (Ingegno, 2000).

Therefore, despite difficult economic times, the top pizza chains throughout the world are staying afloat — especially those that continue to innovate with new products. The packaged-pizza segment, which includes frozen and refrigerated pizzas, continues to witness strong growth. The increasing availability of convenient, low cost and trendy, upgraded ingredients contributes to the consumer appeal of "take-and-bake" products like Pizza (Fricke– stallsmith, 2003).

With regard to Indian scenario, the total cheese market in India, including its variants like processed cheese, cheese Spreads, Mozzarella, flavored and spiced cheese is only 12,000 tonnes and it is valued at around Rs. 180 crores. The demand for cheese is projected to double to Rs 350 crores by 2014-15 (Chudhary, 2007).

In India, the growing popularity of pizzas because of the above reasons has also given a push to the cheese market. Pizzas were hardly on the agenda of Indians a few years ago, when they thought of eating out. In fact, the nineties had seen the Indians accepting more and more variety of foods. It could be foreign to them but after making some modifications, the foods were made to suit their palates. Cheese is gradually becoming popular among Indian populace on account of an increase in the purchasing power, change in lifestyle, more number of working women and growing awareness about the nutritional value of cheeses. About 75,000 pizzas are sold every day in the country. The market is growing at about 300 percent (Chudhary, 2007). Based on this observed trend of cheese utilization, it is assumed that a newer convenient cheese ingredient can be more acceptable by the producers and consumers. Looking to these facts and the ever increasing popularity of cheese as Pizza topping, present study was intended.

Materials and Methods

To develop dried Mozzarella cheese and a standard formulation for topping on the pizza, the raw cheese samples taken with proximate composition detailed in Table 1. The fresh

Mozzarella cheese samples were dried in vacuum tray dryer with temperature 35-43^{0}C under vacuum maintained at 670-690 mm of Hg for 30 min time. Further, the samples were turned three times for expulsion of moisture and dried for 3-3.5 hrs under same drying conditions. The samples were dried with proximate composition (Table 1) with optimized level of each component. The sensory attributes have been examined for optimized dried sample composition after reconstitution with moisture and emulsifying salt as pizza topping.

The dried Mozzarella cheese samples were reconstituted with added pasteurized water and combination of emulsifying salts for use as pizza topping. The dried cheese sample was reconstituted in 5 different moisture levels viz. 40, 45, 50, 55, and 60 percent and they were named T1, T2, T3, T4, and T5 respectively. Reconstitution time was kept 2 hrs for dried cheese.

Similarly, tri-sodium citrate (TSC) in combination with di-sodium hydrogen orthophosphate (DSHP) in 2:1 proportion with five different levels: 0.0, 0.5, 1.0, 1.5, and 2.0 percent (w/w) which were named as T1, T2, T3, T4 and T5. The raw Mozzarella cheese was used as control sample(C).

To study the effect of moisture and emulsifying salt concentration, sensory evaluation was carried out by applying reconstituted cheese on to pizza base. Pizza prepared using the experimental cheeses were subjected to sensory evaluation by the panel of seven judges. A 10-point hedonic scale was used for scoring the attributes such as appearance (considering melting, fat leakage and browning too), flavour, melting, stringiness, chewiness and finally scoring out of the total score of 50. The judges were well aware of the characteristics of the cheese required for pizza.

Results and Discussion

Effect of moisture on sensory attributes

Generally, natural (raw) Mozzarella cheese is used as a topping on pizza. The tendency of the Mozzarella cheese to attain desired pizza functionality with refrigerated storage (1-3 weeks) is an established fact (Kindstedt, 1993; Kindstedt and Guo, 1997; USDA, 2007). Since the dried Mozzarella cheese made in the present study was intended for pizza topping, it is expected to possess all the functionalities as similar as natural Mozzarella Cheese is said to possess during actual pizza baking trials. Hence, it was necessary to evaluate the behaviour of the reconstituted dried Mozzarella cheese by performing actual baking trials.

In the present study, dried Mozzarella cheeses were reconstituted to different moisture levels and baking trials were performed by applying the reconstituted cheese on pizza. The observation made and scores given by the trained panel of judges on sensory properties exhibited by reconstituted samples are reported in this part of the study (Table 2).

It is evident from the values in the table that all the sensory attributes viz. appearance, flavour, melting, stringiness and chewiness scores are higher for dried Mozzarella cheese reconstituted with 60 percent moisture (T5) than any other moisture level of reconstituted dried Mozzarella cheese.

Appearance

The dried Mozzarella cheese reconstituted with 60 per cent moisture (T5) melted properly (i.e. showed even melting and better fusion of cheese particle), appeared white and leaked some fat upon baking. The T5 sample was whiter and glossy than other samples. Dried Mozzarella cheese reconstituted with

40, 45, 50, and 55 per cent moisture lacked melting. Also, the tendency for peripheral browning was more in T1, T2, T3 and T4 samples. Cheese samples T1 and T2 did not melt uniformly on pizza base and grains were observed on the surface of cheese (i.e. at some places, reconstituted cheese failed to fuse with each other). On the other hand the T5 sample had no browning on the peripheral surface of cheese when used as pizza topping. This had reflected in assigning the dried Mozzarella cheese reconstituted with 60 per cent moisture (T5) significantly higher ($P \leq 0.05$) score for appearance than any other sample.

Flavour

The required flavour of Mozzarella cheese should be mild, pleasing and should possess slight acidic taste (USDA, 2007). Mozzarella cheese made by 'direct acidification technique' from milk is not as flavourful as the cheese made by 'starter culture technique'. The flavour scores of the dried Mozzarella cheese reconstituted to different moisture levels and topped on pizza are presented in Table 2. The flavour score for the control cheese sample was perceived to be slightly superior, which was statistically at par with T5 cheese sample having 60 per cent moisture. T1, T2, T3, and T4 cheeses were found to have significantly lower sensory score for flavour than that of control as well as dried Mozzarella cheese reconstituted with 60 per cent moisture (T5). This was mainly due to the perception of 'oily flavour' in dried Mozzarella cheeses which was prevalent sometimes.

Melting

The dried Mozzarella cheese which was reconstituted with 60 per cent moisture (T5) melted more evenly and in uniform manner without showing any identity of grains of dried cheese. However, other samples did not melt to the extent exhibited by the former one. This led to few places on baked pizza where slight uneven surface was observed due to inadequate melting of reconstituted dried Mozzarella cheese. Hence, dried Mozzarella cheese reconstituted with 60 per cent moisture (T5) received significantly ($P \leq 0.05$) superior melting score as compared to that assigned to all other samples (Table 2). The melting score of dried Mozzarella cheese which was reconstituted with 60 per cent moisture was slightly more than the control sample (raw Mozzarella cheese). The score were 7.97 and 7.68 for T5 and C respectively.

Stringiness

The stringiness score (Table 2) shows that dried Mozzarella cheese reconstituted with 60 per cent moisture was higher than the other samples. Both the samples T4 and C exhibited statistically similar stringiness scores. However, the stringiness score was marginally higher ($P \leq 0.05$) for dried Mozzarella cheese made by adjusting 60 per cent moisture than the other samples. The stretch quality of Mozzarella cheese depends on several factors including ingredients used, the pH of final product and the period of refrigerated storage.

Chewiness

It is evident from Table 2 that the chewiness scores of different samples of reconstituted dried Mozzarella cheese vary from each other. The control sample (C) was assigned significantly higher rating for chewiness than reconstituted dried Mozzarella cheeses. The chewiness score was 7.92 for raw Mozzarella cheese (C) and it was 6.71, 6.99, 7.41, 7.69 and 7.84 for T1, T2, T3, T4 and T5 samples respectively. This was because raw Mozzarella cheese (C) had acceptable, moderate degree of chewiness, whereas reconstituted dried Mozzarella cheeses had higher degree of chewiness when judged as pizza topping. The scores of C and T5

however were statistically similar. The greater chewiness of reconstituted cheese was somewhat disliked by the judges. It is worth mentioning here that the chewiness of natural Mozzarella cheese tends to become acceptable with age of the cheese due to the proteolytic changes that occur during its refrigerated storage (Kindstedt, 1993; Kindstedt and Guo, 1997).

Total score

Since dried Mozzarella cheese made by adjusting 60 per cent moisture (T5) had higher score for all of the aspects except flavour and chewiness when studied as pizza topping, it obviously had statistically significant ($P \leq 0.05$) rating for total score as compared to other samples (Table 2). Such superiority of T5 sample over other samples was due to its superior appearance, melting and stringiness characteristics when used as pizza topping. The overall acceptability of dried Mozzarella cheese (i.e. Appearance, melting, stringiness and total sensory rating) could be considered a positive feature over raw cheese. The processing parameters used in the current study could yield dried Mozzarella Cheese that was more acceptable than raw Mozzarella cheese, when both were evaluated on pizza. Based on the results of sensory and baking qualities of reconstituted dried Mozzarella cheese, incorporation of 60 per cent moisture in the dried Mozzarella cheese formulation was recommended.

Effect of emulsifying salt on Sensory Attributes

The experimental dried Mozzarella cheese samples were reconstituted to have 60 per cent moisture as recommended. Further, emulsifying salts, TSC and DSHP in the ratio of 2:1 were added in to the reconstituting water at different levels viz. 0, 0.5, 1.0, 1.5, and 2.0 percent respectively as shown in Table 3. The common salt was added at a rate of 1.0 per cent in all the experimental cheeses. The effective ranking test was used for assessing the suitability of the experimental dried Mozzarella cheese as a pizza topping and sensory scores given by the judges for the dried Mozzarella cheese as topping on pizza. The table shows that the levels of emulsifying salts used have a marked influence on the sensory quality except stringiness of dried Mozzarella cheese as pizza topping. A closer examination of the experimental cheese is discussed below.

Appearance

The colour of Mozzarella cheese required should be natural, bright white and the surface sheen should be attractive as described by Duthie *et al.*, (1980). In the present study, an improvement in the appearance of the dried Mozzarella cheese applied as pizza topping was observed with increasing levels of emulsifying salt addition up to 1.5 percent (w/w). This increase was especially because of the experimental cheese made using higher levels of emulsifying salts appeared whiter, exhibited uniform melting and had lower fat leakage and lower degree of browning as observed on pizza. The average values for appearance score presented in Table 3 indicates superiority of the T4 sample with added 1.5 per cent (w/w) emulsifying salts over the other experimental samples.

The increase in salt content up to 1.5 per cent (w/w) of dried Mozzarella cheese improved the appearance scores. However, increase in emulsifying salt to 2.0 per cent (w/w) lead to slight decrease in the score. The appearance scores varied in a range of 7.21 (T1) to 8.43 (T4). The tabulated scores and relevant statistical analysis revealed a significant ($P \leq 0.05$) difference in the appearance scores of experimental cheeses wherein T4 cheese sample had the highest appearance score.

Table.1 Approximate composition of raw and dried mozzarella cheese

Type of Cheese	Moisture (%)	Fat (%)	Protein (%)	Salt (%)	Acidity (% LA)	pH
Raw Mozzarella	49.99 (49.8-50.15)	18.83 (18.5-19.0)	26 (25.6-26.65)	1.27 (1.18-1.34)	0.51 (0.45-0.54)	5.65 (5.62-5.71)
Dried Mozzarella Cheese	4.82 (4.8-4.85)	35.33 (34.66-36.0)	48.2 (47.5-48.53)	2.21 (2.1-2.44)	1.32 (1.17-1.44)	5.60 (5.53-5.65)

Table.2 Effect of level of moisture during the reconstitution of dried mozzarella cheese on its sensory characteristics

Moisture Level (%)	Sensory Characteristics Scores (Out of 10)					Total score
	Appearance	Flavour	Melting	Stringiness	Chewiness	(Out of 50)
Raw cheese (C)	8.22 (8.07-8.4)	7.97 (7.8-8.1)	7.68 (7.42-7.92)	7.73 (7.42-7.92)	7.92 (7.83-8.0)	39.52 (39.07-39.8)
40 (T1)	6.68 (6.43-6.91)	6.87 (6.72-7.1)	6.78 (6.7-6.9)	6.82 (6.7-6.9)	6.71 (6.63-6.8)	33.86 (33.83-33.89)
45 (T2)	7.33 (7.1-7.5)	7.15 (7.12-7.2)	7.08 (6.95-7.2)	7.29 (7.28-7.3)	6.99 (6.9-7.07)	35.84 (35.37-36.1)
50 (T3)	7.45 (7.21-7.64)	7.31 (7.2-7.4)	7.27 (7.2-7.3)	7.48 (7.42-7.52)	7.41 (7.3-7.5)	36.92 (36.61-37.16)
55 (T4)	7.87 (7.78-7.93)	7.43 (7.3-7.6)	7.60 (7.5-7.7)	7.80 (7.63-7.92)	7.69 (7.64-7.8)	38.40 (38.24-38.58)
60 (T5)	8.31 (8.2-8.42)	7.80 (7.7-7.9)	7.97 (7.8-8.1)	8.38 (8.35-8.42)	7.84 (7.73-7.93)	40.30 (39.8-40.66)
C.D.(0.05)	0.321	0.24	0.256	0.242	0.163	0.575
S.Em.	0.104	0.078	0.083	0.079	0.053	0.187
C.V.%	2.36	1.81	1.94	1.79	1.23	0.86

Table.3 Influence of level of emulsifying salt during the reconstitution of dried Mozzarella cheese on its sensory characteristics

Emulsifier Level (%, w/w)	Sensory Characteristics Scores (Out of 10)					Total score
	Appearance	Flavour	Melting	Stringiness	Chewiness	(Out of 50)
0.0 (T1)	7.21 (6.8-7.58)	7.09 (6.67-7.42)	7.40 (6.9-7.8)	7.51 (6.6-8.25)	7.01 (6.88-7.16)	36.22 (34.38-37.63)
0.5 (T2)	8.00 (7.88-8.13)	7.70 (7.5-8.0)	7.49 (7.34-7.63)	7.65 (7.2-8.0)	7.43 (7.13-7.67)	38.27 (37.68-38.89)
1.0 (T3)	8.07 (7.7-8.25)	7.88 (7.8-8.0)	7.62 (7.5-7.75)	7.94 (7.6-8.38)	7.57 (7.3-8.0)	39.08 (38.0-39.97)
1.5 (T4)	8.43 (8.16-8.63)	8.54 (8.25-8.7)	8.48 (8.33-8.6)	8.51 (8.4-8.63)	8.56 (8.34-8.75)	42.52 (41.99-42.8)
2.0 (T5)	8.32 (7.88-8.58)	7.99 (7.13-8.6)	7.83 (7.6-8.0)	7.85 (7.8-7.9)	7.97 (7.42-8.38)	39.96 (39.19-41.0)
C.D. (0.05)	0.561	0.764	0.452	NS	0.588	1.860
S.Em.	0.178	0.242	0.143	0.264	0.187	0.59
C.V. %	3.852	5.355	3.201	5.792	4.194	2.61

* NS= Non-significant

This higher score observed was because the sample appeared whiter having a more glossy surface sheen than other samples. It also melted uniformly on the peripheral surface of the pizza base. The lowest appearance score observed in sample T1 made without addition of emulsifying salt was due to its rough surface having grains and dull or relatively less surface sheen.

Mizuno and Lucey (2005) studied the non-fat pasta-filata cheese and observed that the experimental cheese had a dried surface, limited melt and poor shred fusion when emulsifying salt was not used. They observed that incorporation of 1.0 per cent TSC to cheese curd yielded cheese exhibiting proper fusion of shreds upon melting of cheese. However, TSC when used at still higher rate (i.e. 5.0 per cent) resulted in a very fluid cheese which flowed out of the pizza crust which was also observed in this study for T5 cheese sample.

Flavour

The flavour of Mozzarella cheese should be bland, walnut like and slightly clean acidic flavour as described by Kosikowski (1958) and Duthie *et al.,* (1980). It can be seen (Table 3) that the average flavour score for experimental samples are in the range of 7.09 (T1) to 8.54 (T4). The scores for dried Mozzarella cheese increased with increase in addition of salt level up to 1.5 per cent and further increase in the salt level to 2.0 per cent (w/w) exhibited a slight decrease in its flavour score. The statistical analysis of the data revealed a significant ($P \leq 0.05$) influence of salt level on the flavour scores of the experimental cheeses. The experimental cheeses made by using low level of emulsifying salt were criticized for lack of desirable flavour by the judges. The experimental cheese made using 1.5 per cent (T4) of salt got higher score because of its desired salty taste. The lowest flavour score was observed in T1 cheese which was made without adding emulsifying salt and so it lacked desired salty taste.

Melting

The melting characteristics of the dried Mozzarella cheese improved linearly with increase in the levels of emulsifying salt up to 1.5 per cent as shown in Table 3. Hence, the judges gave higher score for melting to cheese prepared using 1.5 per cent emulsifying salt. The scores in the table indicate the superiority of the T4 sample over the other experimental samples. Increases in emulsifying salt level up to 1.5 per cent in the experimental samples improved meltability but further increase in level of emulsifying salt to 2 per cent decreased the meltability score. The meltability scores of the experimental cheeses varied in the range of 7.40 (T1) to 8.48 (T4). From the pertaining statistical analysis of the observed data, it is revealed that there was a significant ($P \leq 0.05$) effect of salt level on the meltability of the experimental cheeses. The T4 sample made using 1.5 per cent emulsifying salt had significantly ($P \leq 0.05$) higher score for meltability over other experimental cheeses. It melted evenly throughout the circumference of the pizza base and all of its dried cheese particles were fused together evenly with no browning observed. T1 sample exhibited a minimum meltability score as it did not contain emulsifying salt which resulted to uneven melting over the pizza. Similar improvement in the melting quality of processed cheese system with increase in the emulsifying salt is reported in literature by Cavalier-Salou and Cheftel (1991) and Rizvi *et al.,* (1999).

Stringiness

The experimental dried Mozzarella cheese samples made using different level of

emulsifying salt were assigned sensory stringiness score, which is presented in Table 3. Though the scores shown were non-significant, the experimental sample made using 1.5 per cent of emulsifying salts (T4) had the maximum sensory score, followed closely by the ones made with 1.0 (T3), 2.0 (T5), 0.5 (T2) and 0 (T1) per cent emulsifying salt. The average values for stringiness score presented in the table indicate superiority of the T4 sample over the other experimental samples though it was not significant. Increase in salt content up to 1.5 per cent of dried Mozzarella cheese improved the stringiness scores but further increase in emulsifying salt to 2.0 per cent led to slight decrease in the score for stringiness. All the stringiness scores varied in a range of 7.51 (T1) to 8.51(T4). However, stringiness could not be distinguished significantly by the judges during actual pizza baking trials.

The use of emulsifying salts for improvement and control of melting quality in processing of Mozzarella cheese is also reported in the literature. Rizvi *et al.,* (1999) observed greatest stretch in processed Mozzarella cheese made using 1.5 per cent level of TSC as compared to use of 0.5 or even 1.0 per cent. Mizuno and Lucey (2005) studied non-fat pasta-filata cheese using 1.0 per cent TSC which yielded maximum stretch as compared to those made without TSC or made using 3.0 and 5.0 per cent levels of salts.

Chewiness

The tabulated average values for the chewiness characteristic of the dried Mozzarella cheese shown in Table 3 are in the range of 7.01 (T1) to 8.56 (T4). It also shows simultaneous increase in score with increase in level of emulsifying salt up to 1.5 per cent which were statistically significant ($P \leq 0.05$).The experimental cheeses made by using low level of emulsifying salt or without emulsifying salts were criticized for higher chewiness by the judges. The experimental cheese made using 1.5 per cent (T4) of salt was getting a higher score because of presence of its desired chewiness. The lowest score for chewiness was observed in T1 sample which was made without emulsifying salt. It had thick very chewy body and hence scored minimum. Addition of emulsifier salts tends to decrease the thickness and strength of the ropy strings of protein matrix making them smoother and finer. Such effect in controlling the texture of Indian Mozzarella cheese which is otherwise not liked for pizza application is reported by Patel and Upadhyay (1998, 1999).

Total score

The total sensory scores of dried Mozzarella cheese indicates its overall organoleptic quality which can be considered as an index for preference of the product by the consumers. The average total sensory scores (Table 3) was in the range of 36.22 (T1) to 42.52 (T4). The consistent trend of increase in total score with increase in salt level up to 1.5 per cent of emulsifying salt addition has been obtained for all its sensory characteristics such as appearance, flavour, melting, stringiness and chewiness. The T4 experimental cheese made using 1.5 per cent emulsifying salts had significantly ($P \leq 0.05$) higher total score followed by T5, T3, T2 and T1. The highest total sensory score of T4 sample was attributed to significantly ($P \leq 0.05$) higher appearance, flavour, melting and chewiness score during sensory evaluation of the products by judges and vice-versa.

Based on the these observations, it was concluded that the mixture of emulsifying salts (Tri-sodium citrate (TSC) mixed with di-sodium hydrogen orthophosphate (DSHP) in the ratio of 2:1) at the rate of 1.5 per cent (w/w) yielded a reconstituted cheese having

superior functional properties for use on pizza such as melt, stretch, flavour as well as chewiness. Hence the proportion (2:1) and the rate (1.5 percent, w/w) can be chosen over other salt levels studied for the formulation of dried Mozzarella cheese as pizza topping.

The objective of the present study was to investigate the effect of moisture and emulsifying salt on dried Mozzarella cheese for use as pizza topping. They were used as pizza topping after reconstituting in water along with emulsifiers and common salt. The raw and dried cheese samples with proximate composition has been evaluated organoleptic characteristics (i.e. appearance, flavour, melting, stringiness, chewiness and total score) and optimized level of moisture and emulsifying salt was finalized for reconstitution of dried Mozzarella cheese for use as pizza topping.

It was concluded after examination, the dried Mozzarella cheese reconstituted with 60 percent moisture had significantly superior sensory total score than the other experimental cheeses reconstituted with different levels of moisture. This was because it fetched significantly superior scores for appearance, flavour, melting, stringiness and chewiness.

Similarly, five different levels of emulsifying salts were added in water to be used for reconstitution. Common salt was added with fix addition rate along with emulsifying salt. The consistent trend of increase in total score of dried Mozzarella cheese with increase in salt level up to 1.5 per cent of emulsifying salt addition was obtained. Based on these observations, it was concluded that the mixture of emulsifying salts at the rate of 1.5 per cent (w/w) yielded a reconstituted cheese having superior functional properties for use on pizza such as melt, stretch, flavour as well as chewiness. Hence the proportion (2:1) and the rate (1.5 percent, w/w) can be chosen over other salt levels studied for the formulation of dried Mozzarella cheese as pizza topping.

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