



## ORIGINAL ARTICLE

# The Effect of Monocalcium Phosphate on some Quantitative Properties of Mozzarella cheese

ShabnamImani Shahabad<sup>1</sup> and Bahare Sadrolodabae<sup>2</sup>

1.Sofian Branch, Islamic Azad University, Sofian, Iran

2. Sarab Branch, Islamic Azad University, Sarab, Iran

Email: [sh\\_imani2008@yahoo.com](mailto:sh_imani2008@yahoo.com)

### ABSTRACT

*Cheese is a rich product in protein, calcium and phosphorus of milk which plays an important role in food security of society. Nowadays, one kind of Cheeses used the most considering the increasing demand of fast food is Mozzarella Cheese that is one of the important Italian unripe soft cheeses coming from the Pastafilata cheese groups or stretched-curd and it is obtained by cow's full milk with frictional Operation and plasticizing of fresh curd in hot water. monocalcium phosphate (mcp) is used as text urizer combination, dehumidifier and constraint of dough in food as well as in medicine as anti reflux drugs. In this study, commercial monocalcium phosphate was added to milk with concentrations 0/01 , 0/03 and production process of cheese was carried out using enzyme starter and The effect of different concentrations of mono-calcium phosphate on moisture, production efficiency and protein percentage of the final product was compared with the control sample.. Results showed that the effect of monocalcium phosphate on the three said features were significant at the 99% level and with increasing concentration of monocalcium phosphate to 0/05 percent as well as increasing the efficiency and product moisture, the amount of protein sample enhanced from 17/5 percent in control sample to 23 percent leading to maintain more protein Mozzarella Cheese Product.*

*Keywords: Mozzarella cheese, mono-calcium phosphate*

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### INTRODUCTION

Cheese products are made up of fat and milk protein with calcium and phosphorus which have been combined with milk protein in different ways. This substance has an important role in daily diet. Its importance in removing some parts of portion and calcium needs of consumers indicates the value of this nutrient.

Mozzarella cheese is of the most important Italian unripe soft cheeses and from Pastafilata cheese groups or stretched-curd that traditionally it is obtained by cow's full and fat milk with frictional Operation and plasticizing of fresh curd in hot water and it has a special fibrous structure as well as particular melting and stretch [1,6].

Recently this cheese is produced using the technique of starter-enzyme and in less amount compared with processed Cheese( Pizza ) in Iran . This Cheese due to a long history in Italy is supplied in several forms including grated, sliced, minced, clove and piece.

Now , this cheese is produced in two methods of cheese starter-enzyme and acidic- enzyme in world that the starter-enzyme type has three types:

A: Mozzarella (scamorza)

B: Low Moisture Mozzarella

C: Mozzarella with partially skimmed milk [2]

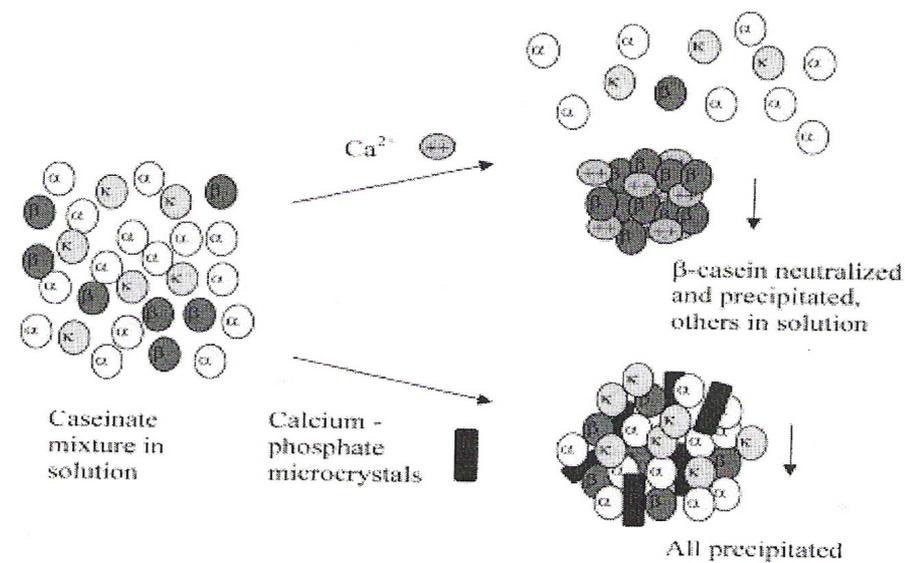
Len Hoff et al. (2002) studied the casein precipitation B in the presence of mono-and poly-phosphates at pH = 5/5 and pH = 7/5. [7].

They obtained results concerning the patterns of casein precipitation with calcium and phosphate ions at pH = 5/5 pH = 7/5 that the most important ones are :

The most important factor in the precipitation of casein B in the absence of phosphate ions is the effect of neutralizing the negative charges of protein molecules by poor absorption of Ca<sup>2+</sup>.

When calcium ions link specifically with casein, adding single capacity electrolyte does not have a significant effect on precipitation of casein, the presence of phosphates leads to more complete precipitation of protein. Separation mechanism transforms to the precipitation of protein and small inorganic crystals. Phosphate activity in isolating casein is reduced as follows: Linear phosphate > monophosphate > phosphate.

Effects of phosphate is more remarkable at pH = 7/5 than pH = 5/5. Commercial casein mixtures are found to be the most effective impact of phosphates in which only a small part of the protein is absorbed by the single  $Ca^{2+}$  and it deposits. The reason of increasing the separation compared to the selective precipitation of casein B by  $Ca^{2+}$  ions precipitation of protein complex with inorganic micro-crystals is expressed that can be seen in the figure below [7].



**Figure 1- Comparison of the absorption of proteins by  $Ca^{2+}$  and calcium phosphate in commercial casein solution**

The purpose of this study is to investigate the effect of monocalcium phosphate on moisture, protein and the efficiency of Mozzarella cheese.

## MATERIALS AND METHODS

### Raw materials

Raw materials used to produce the product include:

Skimmed milk -starter-rennet -cream-butter, white cheese mono-calcium phosphate monocalcium phosphate with desired concentrations was added to the cheese during the cooking process, and it was prepared by Beldem company.

### Machines

Devices and equipment used to produce the supply are:

- Cheese laboratory cooking pot
- Mechanical crusher
- Steel tanks

### Production steps

Cheese production, took a few steps that include: Starter culture, inoculation, coagulation, cutting, draining, curd production, grinding, tension test, Cheese baking that details of which are as follows:

chopped raw cheese is poured in cooking pot and the steam valve will be opened until cheese is hot and texture is uniform, It should be noted that the vapor pressure is 0/25-0/75 Bar and the temperature in cooking pot is 70-75 ° C. Then the white cheese, cream, butter is added to the tank according to the formula respectively. The cheese texture will be elastic due to continuous stirring and temperature and salt. The cooking pot has two arms that their rotation speed is 31 rpm and it is double glazing that the steam is re-circulating in its wall.

**Chemical tests**

**Chemicals**

Chemicals used in chemical tests were mainly made from Merck company.

**Chemical tests of Mozzarella Cheese:**

**Moisture**

The technique of determining the moisture amount was conducted according to the Iran national standards 1753 in 1356 , Determination of dry material of cheese and melted cheese [4].

**Protein**

“The measurement of the protein content of melted cheese” according to the national standard of Iran 1811 was performed in 1356 [5].

**Efficiency**

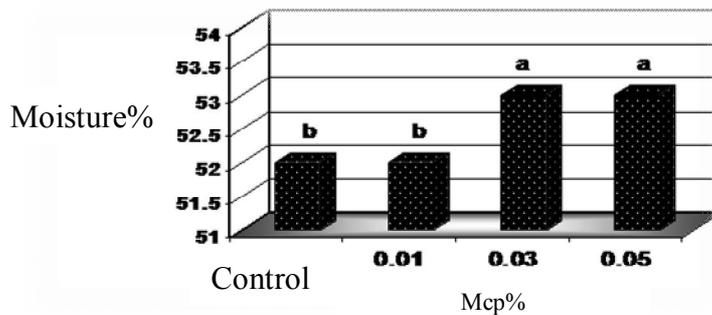
The usual methods of efficiency are in terms of kg of cheese obtained from 100 g milk. The efficiency can be considered based on kg of cheese obtained from 100 hecto-litre milk with liters of milk to produce 1 ton of cheese [3].

**RESULTS**

**Chemical composition of cheese**

Moisture of Mozzarella cheese:

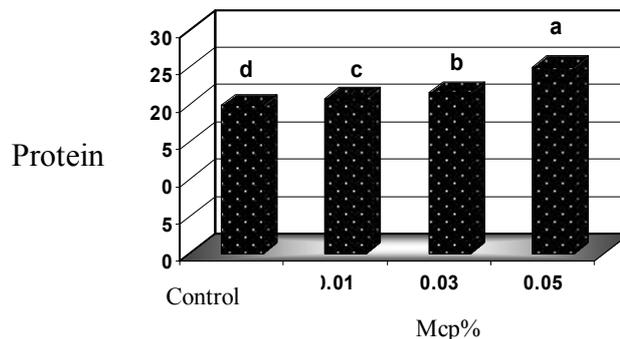
With increasing the amount of calcium monophosphate, the moisture of samples increases so that the sample contains 0/05 percent mono-calcium phosphate has the highest moisture and the lowest moisture is control sample.



**Figure2- The effect of monocalcium phosphate on mozzarella cheese’s Moisture**

**Mozzarella cheese’s protein**

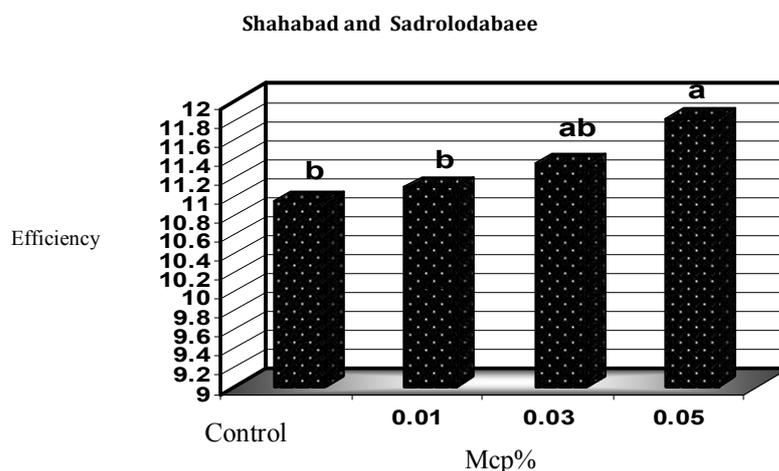
Parallel to increasing amount of mono-calcium phosphate, amount of sample ‘s protein has significantly increased at the level of confidence 99%(a=1%) and the sample containing 0/05% reached the highest i.e. 23% and we have the lowest amount in control sample that is 17.5 %.



**Diagram 3. The impact of increasing Monocalcium phosphate on Mozzarella cheese ‘s protein**

**The efficiency of Mozzarella cheese:**

Adding monocalcium phosphate causes a significant difference in samples at the level of confidence 99% , the highest and lowest efficiency are respectively related to control sample and sample containing 0/05% of monocalcium phosphate.



**Figure4- The effect of adding monocalcium phosphate on mozzarella cheese's efficiency**

## DISCUSSION

With increasing the amount of Mono-calcium phosphate, the samples's moisture increased so that the samples containing 0/05 percent monocalcium phosphate has the highest moisture and the lowest moisture is related to the control sample. With the increase in the percentage of monocalcium phosphate when forming the curd, amount of absorption of milk's calcium inside the curd has grown. as a result, the bridges of calcium phosphate between casein molecules and also among the micelles are composed of a greater number. Obviously, the creation of a cross linking in the presence of calcium ion, put together a network of micelles that part of water is enclosed in it and this causes the increase of percentage of moisture in product. Of course, increase of percentage of moisture may also be due to water hydrates in parallel to increase of monocalcium phosphate [7,9].

The reason of increase of protein is that adding monocalcium phosphate causes the formation of more cross-linking, and also leads to linkage of protein sub-micelles in curd together and transforming them into larger and bigger micelles that the micelles eventually remaining in the curd structure and thus prevents leaving the protein solution in cheese's water [7].

Increase of efficiency is related to increase of moisture and protein in samples containing monocalcium phosphate [7,8].

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9. Anonymous. Monocalcium phosphate available online: <http://www.chemsoc.org/ExemplarChem/entries/2001/anderson/e3411.htm> PRIVATE " TYPE = PICT; ALT = Monocalcium phosphate.

## CITATION OF THIS ARTICLE

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