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Modified starches or stabilizers in preparation of cheese bread

Amidos modificados ou estabilizantes na elaboração de pão de queijo

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ABSTRACT

Cheese bread is a Brazilian product which originated in Minas Gerais and which is highly consumed. In industrial production, there is increasing use of additives which enrich and enhance the physical of this product, adding value in the eyes of the consumer. Thus, the purpose of this paper was to study the effect of addition of modified starch and stabilizers on the physical-chemical of cheese bread. For this reason, measures taken so moisture, pH and acidity, volume, density, coefficient of expansion, and compression resistance (texturometer) Results show that the stabilizers used improve these characteristics in the cheese bread, showing better physicochemical characteristics.

Key words: *modified starch, cheese bread, physicochemical analyzes.*

RESUMO

Pão de queijo é um produto brasileiro que se originou em Minas Gerais e que é altamente consumido. Na produção industrial, há uma crescente utilização de aditivos que enriquecem e melhoraram as características físicas do produto, acrescentando valor aos olhos do consumidor. Assim, o objetivo deste trabalho foi estudar o efeito da adição de amido modificado e estabilizadores sobre a qualidade físico-química de pão de queijo. Por esse motivo, foram tomadas medidas para umidade, pH e acidez, volume, densidade, coeficiente de dilatação e resistência à compressão (texturômetro). Os resultados mostram que os estabilizadores usados melhoraram estas características no pão de queijo, mostrando melhores características físico-químicas.

Palavras-chave: *amido modificado, pão de queijo, análises físico-químicas.*

INTRODUCTION

Cheese bread is a traditional product of the state of Minas Gerais, Brazil, (SILVA et al., 2009), whose production has increased greatly in recent years in association with market growth, including export of the product (MINIM et al., 2000). However, despite its great importance in market, due to its growing consumption, does not have well-defined manufacturing standardizations, identity and quality. Research about it are rare, leaving the desired information about the product and its quality standards (MACHADO & PEREIRA, 2010).

The starch or fecula of manioc, better known as sweet tapioca, and the starch or fecula of fermented manioc, better known as sour tapioca (PEREIRA et al., 1999), are used as the main ingredients in confection of many bakery products. The sour tapioca is a type of manioc starch modified by a natural fermentation process and drying in the sun (MACHADO et al., 2010).

Just as sour tapioca, any starch that undergoes a fermentation process, thermal treatment, exposure to radiation, activity of organic acids produced by microorganisms or even undergoes the action of microbial enzymes comes to be called modified starch (BEMILLER, 1997). These modifications of the starches arose as a result of the limitations of pastes and gels obtained from native starches for application in the food industry (SILVA et al., 2006).

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Have developed so some work in order to verify the effect of these modified starches for breadmaking food. APLEVICZ & DEMIATE (2007) study for characterization of native and modified manioc starch observed that the modified starch with hydrogen peroxide showed a high degree of expansion and higher percentage of transmittance, thus forming folders clearer starch, these desirable characteristics for preparation of cheese bread and biscuit recipes. SILVA et al. (2006) studied the physicochemical characteristics of modified starches used in food modified starches had reported that technological properties of interest for some applications in the food industry such as the strength of your folders to cycles of freezing and thawing , with its interesting job frozen cheese loaves , since the release of water affects the quality of the final product and high expansion when used in the production of biscuits observed that the modified starch with hydrogen peroxide showed a high degree of expansion and higher percentage of transmittance, thus forming folders clearer starch, these desirable characteristics for preparation of cheese bread and biscuit.

It is observed that the production of modified starches makes the use of these starches viable in food industries, together with stabilizers, which, according to BRASIL (1997) are considered as food additives that allow the maintenance of uniform dispersion of two or more unmixable substances in a food product. Moreover, conveys to the application of stabilizers, especially the gums, in various bakery products and pasta with improvements in aspects such as texture, volume and shelf life (TUBARI et al., 2008; VERNAZA & CHANG, 2012; RAMOS et al., 2012) thus it becomes feasible to study the application of this stabilizer also in cheese breads.

Thus, the purpose of this paper was to study the effect of different modified starches and stabilizers on cheese bread by discrimination of different treatments in regard to physical-chemical characteristics and identify the modified starches and stabilizers that confer the best characteristics.

MATERIAL AND METHODS

The experiment was conducted in the Laboratory of Cereal Grains and the Department of Food Science, Federal University of Lavras. The formulation of cheese bread used in the experiment: 200g of sweet tapioca, 50g of sour tapioca, 130mL of milk, 50g of margarine, 8g of salt, 1egg and 150g of catiara cheese. The other formulations were obtained as of this base formulation. Two types of modified starches and three types of stabilizers from Gemacomtech were used. 5% and 10% of each modified starch and 0.3% and 0.5 % of stabilizers were added, in relation to the total amount of tapioca. Compounding the treatments of table 1.

The development of the dough was in a planetary mixer with the following steps: mixing the sweet and sour starch with modified starch or stabilizer; scalding with a mixture containing half milk, salt and margarine and banging for 5min; addition of egg and banging by 1.5mim, adding the other half of the milk and banging me for over 1.5mim; addition of cheese and by banging 3mim. The dough was molded into cylindrical tube of PVC (polyvinyl chloride) in diameter 3cmx3cm tall and the finish was done manually to get round format. The cheese breads were obtained after baking for 35 minutes at a temperature of 180°C in oven Suggar, FE4221BR model, made in China. After cooling to room temperature followed to perform the analyzes.

Table 1 - Description of the treatments.

Treatment	Description
T1	Cheese bread with addition of 5% acetylated and cross-linked modified manioc starch
T2	Cheese bread with addition of 10% acetylated and cross-linked modified manioc starch
T3	Cheese bread with addition of 5% acetylated pregel modified manioc starch
T4	Cheese bread with addition of 10% acetylated pregel modified manioc starch
T5	Cheese bread with addition of 0.3% CMC and galactomannan (tara gum and guar gum) based stabilizer
T6	Cheese bread with addition of 0.5% CMC and galactomannan (tara gum and guar gum) based stabilizer
T7	Cheese bread with addition of 0.3% xanthan gum and carrageenan based stabilizer
T8	Cheese bread with addition of 0.5% xanthan gum and carrageenan based stabilizer
T9	Cheese bread with addition of 0.3% galactomannan (tara gum and guar gum) based stabilizer
T10	Cheese bread with addition of 0.5% galactomannan (tara gum and guar gum) based stabilizer
T11	Standard cheese bread, without additives

The experiment was conducted according to a completely randomized design with three replicates. The moisture was determined second Official Methods of AOAC (2000) and analysis of pH and titratable acidity followed the methodology described by PLATA- OVIEDO & CAMARGO (1995).

The diameter and height of the molded dough was determined by means of a caliper and its weight determined semi analytical balance. The same measures were also observed in cheese bread after baking.

Absolute density of the doughs and the cheese bread was determined by the ratio between the dough (g) and the volume (cm^3). Volume was measured by the millet seed displacement method, according to GRISWOLD (1972). And coefficient of expansion was determined by the following formula{(cheese bread volume – dough volume)/dough volume}x100.

To verify the resistance to compression of the cheese bread was used texture analyzer Stable Micro Systems, modelo TA.XT2, with a cylindrical aluminum probe with a flat end and 100mm diameter, following the methodology described by MACHADO & PEREIRA (2010). The apparatus was calibrated to the following parameters to undertake the tests: test speed = 2.0mm s^{-1}, pre-test speed = 2.0mm s^{-1}, post-test speed = 2.0mm s^{-1}, force = (N) and compression distance = 10.0mm.

The analyzes of moisture, pH, acidity, density and resistance to compression were performed for both dough and for the cheese bread. Have the analyzes of expansion coefficient and volume were performed only in cheese breads. As for discrimination of the treatments in relation to the physical-chemical variables for the cheese bread and dough, the multidimensional scaling technique was used, following the procedure recommended by BORG & GROENEN (2005). This reduction was validated considering the approximation between the dissimilarity matrix obtained from the original data and from the variables selected as indicated by DE LEEUW (1988).

RESULTS AND DISCUSSIONS

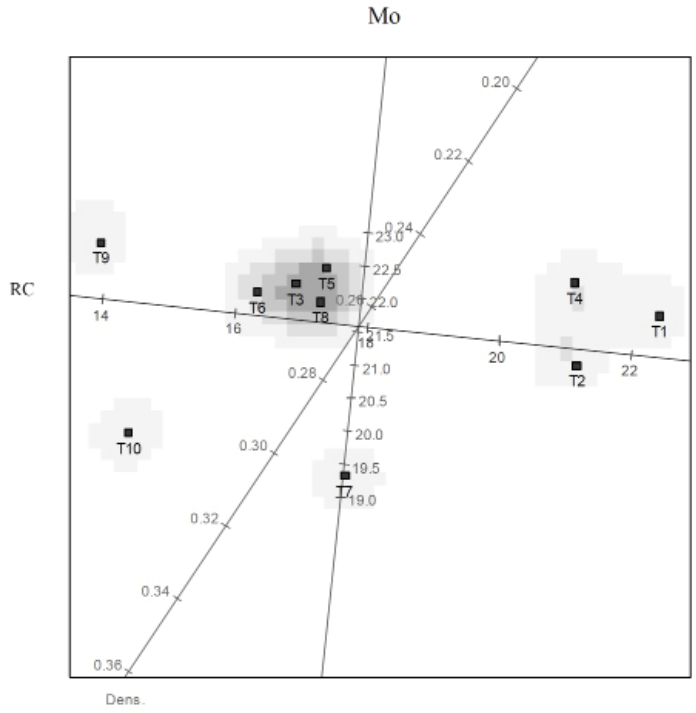
Discrimination of the treatments considering the physical-chemical variables for the cheese bread

Prior to discrimination of the treatments, selection of the variables was carried out, which were: moisture, pH, titratable acidity, absolute density, coefficient of expansion and volume of the cheese bread. In light of that, the best configuration involving the reduction of physical-chemical variables in statistical analysis which allowed discrimination of the treatments (Table 1) is shown in figure 1.

From the results described in figure 1, discrimination of the treatments in two regions is perceived. Thus, there is evidence that treatments T3, T5, T6 and T8 are similar. One likewise observes similarity among T1, T2 and T4. With a view toward better confirmation, reporting the results described in tables 1, we can observe that the treatments belonging to the first grouping (T3, T5, T6 and T8) did not contribute to dissimilarity for the cheese bread of these treatments in regard to the moisture and resistance to compression variables. Thus, the cheese bread with the addition of acetylated pregel modified manioc starch at 5% (T3), of CMC and galactomannan based stabilizer at 0.3% and 0.5% (T5 and T6 respectively), and of xanthan gum and carrageenan based stabilizer at 0.5% (T8) presented a similar moisture and resistance to compression, since this grouping is found on the graph in a region delimited by the straight lines of these two variables. ANDRADE (2012) studying these same additives at the same concentrations observed statistically that there was no difference regarding the moisture between these treatments, which supports the fact that in this work it is located in the same group. With respect to texture profile, another factor which was used to characterize the group, it can be said that the presence of stabilizing gums that bind water reducing crystallization and recrystallization contributes to the softness of the cheese bread with added stabilizers.

In relation to the treatments belonging to the second grouping (T1, T2 and T4), the common characteristic among them is provided by the fact that these treatments correspond to the cheese bread with the addition of modified starch composed of the addition of acetylated and cross-linked modified manioc starch at 5% and 10% (T1 and T2 respectively) and addition of acetylated pregel modified manioc starch at 10% (T4). Thus, different quantities of a type of starch and a greater concentration of another type of starch contributed to joining these different types of cheese bread in a similar group in regard to the texture and density characteristics. The discrimination of this group may be linked to the fact that modified starches are responsible for the formation of alveoli that incorporate air during the beating of the doughes, making them less dense.

Finally, it may be observed that treatments T7, T9 and T10 are found in dispersed regions on the graph thus presenting dissimilarity in regard to moisture, texture and density in relation to the formed groups.



Treatments	Additives	Concentration
T1	acetylated and cross-linked modified manioc starch	5%
T2	acetylated and cross-linked modified manioc starch	10%
T3	acetylated pregel modified manioc starch	5%
T4	acetylated pregel modified manioc starch	10%
T5	CMC and galactomannan based stabilizer	0.3%
T6	CMC and galactomannan based stabilizer	0.5%
T7	xanthan gum and carrageenan based stabilizer	0.3%
T8	xanthan gum and carrageenan based stabilizer	0.5%
T9	galactomannan based stabilizer	0.3%
T10	galactomannan based stabilizer	0.5%

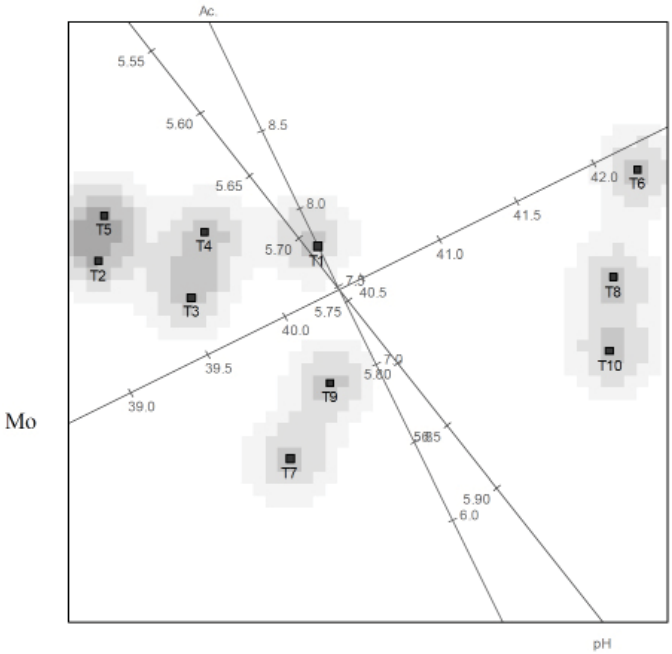
Figure 1 - Biplots for the physical-chemical variables of Density (Dens), Resistance to compression (RC) and Moisture (Mo).

Discrimination of the treatments considering the physical-chemical variables for the dough

Maintaining the same purpose of application of the multidimensional scaling techniques in reduction of moisture, pH, acidity, density and texture variables for the cheese bread dough, as well as discrimination of the treatments (Table 1), the results are shown in figure 2.

The results illustrated in figure 2 showed the formation of three distinct groups formed by the grouping of the treatments. Thus, considering the region limited by the acidity (Ac) and moisture (Mo) variables, it may be perceived that treatments T1, T2, T3, T4 and T5 represented a group in reference to similarity for the Acidity (Ac.) and Moisture (Mo.) variables. SILVA et al. (2006) reported in their work that some modified starches had high levels of acidity, related to the presence of reagents used in their production, with no presence of carboxyl groups in their macromolecules. Added to the fact that for obtaining acetylated starch, manioc starch undergoes an esterification process which affords the acetylated starch and acetic acid, the latter responsible for the acidity lifting and pH lowering in the dough of cheese bread.

It is also important to note that one of the most important properties of the starch is gomification, enabling absorption in heating up to 2500 times its weight in water (CEREDA, 2002). These properties may have contributed to all treatments added modified



Treatments	Additives	Concentration
T1	acetylated and cross-linked modified manioc starch	5%
T2	acetylated and cross-linked modified manioc starch	10%
T3	acetylated pregel modified manioc starch	5%
T4	acetylated pregel modified manioc starch	10%
T5	CMC and galactomannan based stabilizer	0.3%
T6	CMC and galactomannan based stabilizer	0.5%
T7	xanthan gum and carrageenan based stabilizer	0.3%
T8	xanthan gum and carrageenan based stabilizer	0.5%
T9	galactomannan based stabilizer	0.3%
T10	galactomannan based stabilizer	0.5%

Figure 2 - Biplots for physical-chemical variables for dough: pH (pH) Acidity (Ac) and Moisture (Mo).

starch remained in the same group as the aspects of moisture and acidity.

It is fitting to emphasize that all the treatments with the addition of modified starch, regardless of the type of starch and of the quantity added were not out of keeping with the acidity and moisture profiles. In addition, the T5 treatment with the addition of 0.3% CMC and galactomannan (tara gum and guar gum) based stabilizer had acidity and moisture similar to those found for the doughs of the treatments with the addition of modified starches.

Treatments T6, T8 and T10 were also joined in another grouping presenting similar moisture and pH profiles. In this case, the quantity of stabilizer added may have led to the effect that these treatments did not differ among themselves since T6, T8 and T10 are all treatments with the addition of different stabilizers in the greatest concentration tested (0.5%).

Finally, T7 and T9 presented similarity in regard to acidity and moisture. Once more, it may be perceived that this grouping occurred through treatments with the addition of the same quantity, in this case 0.3%, of two different stabilizers.

CONCLUSION

The effect of the additives, modified starch and stabilizer on the physical-chemical of the cheese bread was notable. Both for dough and for cheese bread, in general, the use of modified starch and of stabilizer served to discriminate different groups of cheese bread. To the mass to highest concentration of all stabilizing served to discriminate against a group with similar profiles of moisture and pH. As for cheese bread, we observed the formation of groups with similar profiles of moisture and compressive strength formed by different types and amounts of stabilizers

and starches.In general groupings composed of types of cheese bread with the addition of stabilizers had better physical-chemical characteristics, making for less dense and softer cheese bread and less acidic dough.

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