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## The Effect of the Contaminated Starter with Yeast on the Quality of the Kurdish Fermented Milk (Mast)

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### Abstract

*Mast is the type of set yoghurt manufactured in Kurdistan, it is firm fermented milk, characterized by yeasty, sharpen acidity and firm consistency. Applying the same traditional method by using local mast in the Sulaimani city as starter which contains lactic acid bacteria with contaminated yeasts. The starters were divided into four parts, the first one was the control and the other three parts were treated with heat in water bath for (60°C/10 minute, 65°C/10 minute and 65°C/20 minute) respectively. The experiment reported that the control (untreated starter) have the highest yeast cells count (100%), and the starter treated with 65°C/20 minute have the lowest yeast cells count (0.3%). The starter treated with 65°C for 10 and 20 minute produces best mast quality according to the sensory test in comparison with other treatments.*

**Keywords:** Fermented milk, heat treatment, lactic acid bacteria, yeast.

### Introduction

There has been a phenomenal increase in the production and consumption of fermented milks in the developed countries of the world for use as nutritious and refreshing beverages or as therapeutic agents in the treatment of gastrointestinal diseases [1]. The dairy industry uses well-defined single strain and multiple strain starter cultures to obtain dairy products of high and constant quality. Mast is the traditional type of fermented milk which is produced by villagers in Kurdistan. The best mast is made from ewe's milk. The villagers made even the mast from the cows and goats milk. A high proportion of the fermented milks produced in Kurdistan region are manufactured in the rural and mountainous areas. In such products where unidentified starters are added, fermentation occurs as a result of the wild flora present in the surrounding environment and these are present in the final batch of residues yoghurt.

As knowledge regarding the benefits of yoghurt consumption increases, the presence of live lactic acid bacteria in yoghurt has become of great importance.

The Kurdish consumers react with flavour of the mast, especially the sweetness factor which is very important since the mast is consumed at breakfast. The texture and the appearance also have a significant role when setting the masts market price. These are the basic three factors to judge the quality of the mast. They use old mast as starter, and this starter contains lactic acid bacteria with contaminated yeasts, just like many fermented milk in the Middle East area [2,3]. The texture and the flavour of the mast are similar to the yoghurt in the first period of storage (2-3 days), but the flavour of the mast becomes yeasty and sharpens acidity under the next period of storage (4-10 days).

For this reason the mast is used as mastau (mixture between mast and water), which is similar to the Turkish ayran [4].

The main goal of this study is to minimize the yeasty and the sharpen acidity in the mast in order to increase its shelf-life.

### Materials and Methods

Fresh whole cow's milk was obtained from the herd of the faculty of Agriculture Sulaimani University. The fat content of this milk was adjusted to 3% and used for preparing mast samples. It was heated at 92°C for 10 minute and then cooled to 45°C. Starter taken from the best quality of the local mast in Sulaimani city was also used in this study. The starters were divided into four parts, the first part served as control and the following three parts were treated with heat in water bath for 60°C/10 minute, 65°C/10 minute and 65°C/20 minute respectively. After heat treatment, 2.5% starter was added to milk at 45°C. All samples were mixed very well then the samples were separately distributed into 100 ml sterile plastic cups, and incubated at 42°C until completely coagulated after about 4 hrs. The cups were stored in refrigerators at 4°C under the experiment period (0, 24, 48, 72, 96, 120, and 144 hrs). Titratable acidity percentage [5] and total yeast counts using potato dextrose agar PDA [6] were determined as well as the sensory test was done according to the following table information which is approved by the American Dairy Science Association [7].

Attribute	Perfect score
Flavour	10
Body and texture	5
Appearance	5
Total	20

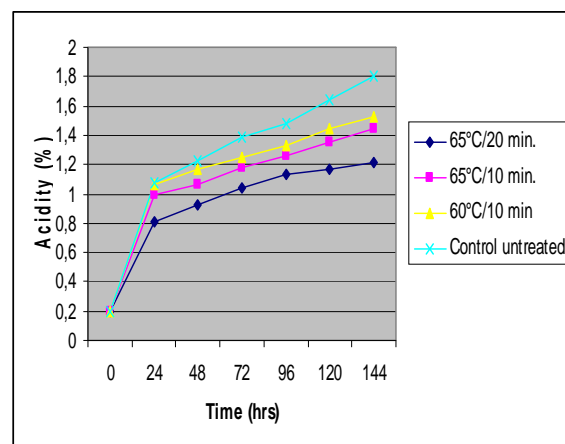
### Results and Discussion

The consumption of yoghurt in many countries shows a vast increase and as a result research into the potential benefits continues. The most popular tests for monitoring starters

are the development of the acidity in the growth medium [7]. Table 1 reported that the titratable acidity percentage in the mast with different heat treatment at six days storage is different to the rate of the development of the acidity.

It could be observed that the titratable acidity after 48 hours was between 0.92% (65°C/20 minute) and 1.22% (control) and these results are in agreement with those obtained for the Egyptian zabady which is 0.94% [8], and 1.24% [9]. After 144 hours of storage, the acidity was 1.21% in case of 65°C/20 minute treatments; meanwhile it was 1.80% in the control. The predominant microbial contaminants of mast are yeasts. Table 2 reported the effect of heat treatment on the yeast cells which are found as contaminants in the starter.

It was clear at 65°C/20 minute 99.7% of the yeast cells were destroyed. The storage under low temperature will stop the activity of lactic acid bacteria, but the yeast cells can grow under this storage temperature [8], so this kind of activity for the yeast cells can be responsible on the rate of the acidity development which is clear in the Figure 1.



**Figure 1: Effect of heat treatment on the development of the acidity of mast under storage period.**

The relation between the quality of mast and the yeast count is clear in Table 2. The control (untreated starter) had the highest count of yeasts number (100%), and the starter treated with 65°C/20 minute had the lowest count of 0.3%. Other researchers reported different numbers of yeast cells in traditional fermented milk [10-13]. The mast which was produced from starter with low count yeast cells was accepted by the consumer even after 144 hrs storage in refrigerator. The sensory scores of mast are summarized in Table 3. It reported that the best quality was at the first four days in synthesized mast from 65°C for 10 and 20 minute treated starters at the same temperature. The control (untreated starter) and the starter treated with 60°C for 10 minute reported that the degree of acceptability of the consumer were minimum under the same period, and the intensity of unacceptable flavoured was increased with time and reached its maximum after 3-4 days especially in case of mast which is synthesised from untreated starter. On the other hand, the control and the mast synthesized from starter heated to 60 °C/10 received the lowest scores in all the features under investigation except for body and texture. This probably to the presence of large amount of microorganisms in the initial inoculum size. While mast made with starter

cultures (65°C for 10 and 20 minute) received significantly higher scores for flavour and appearance except in the first two days, the score of body and texture of mast made from treated starter (65°C for 20 minute) was low in comparison with other treatment and this may attributed to the decreasing of lactic acid bacteria in the starter in action of heat treatment, since according to IDF standard 163 [14], the minimum counts of characteristic microorganisms in yoghurt should be  $10^7$  cfu/g at the time of sale.

### Conclusion

This study shows that the contamination of the starter is the major point and problem to raise the acidity in the mast under the storage period, and mast made with heated starter cultures at 65°C/10 minute and 65°C/20 minute were preferred by panellists. With high number of the yeast cells in the starter we can benefit from the mast to produce the mastau. Also the present study is the first, to our knowledge, to report using different heat treatments for starters in order to minimize the contamination with yeasts in Kurdistan region of Iraq and to recognize the different flora in the Kurdish mast.

**Table 1: Effect of heat treatment on the acidity of mast under storage period.**

Treatment/ Time(hrs)	Acidity (%)			
	65°C/20 minute	65°C/10 minute	60°C/10 minute	Control (untreated)
0	0.2	0.2	0.2	0.2
24	0.81	0.99	1.06	1.08
48	0.92	1.06	1.17	1.22
72	1.04	1.18	1.25	1.39
96	1.13	1.26	1.33	1.48
120	1.17	1.35	1.44	1.64
144	1.21	1.44	1.53	1.80

**Table 2: Effect of heat treatment on the yeast count in the starter.**

Type of treatment	Yeast count after 24 hrs	
	Count (cfu/g)	Yeast cells destroyed%
Control (untreated)	15150	0
60°C/10 minute	9250	39
65°C/10 minute	5800	62
65°C/20 minute	46	99.7

**Table 3: Evaluation scores of mast under storage period.**

Time	Attribute	Treatment			Control (untreated)
		65°C/20 minute	65°C/10 minute	60°C/10 minute	
24	Flavour	10	9	6	6
	Body & Texture	3	5	5	5
	Appearance	5	4	4	4
	<b>Total</b>	<b>18</b>	<b>18</b>	<b>15</b>	<b>15</b>
48	Flavour	9	8	6	5
	Body & Texture	4	5	5	5
	Appearance	5	4	4	3
	<b>Total</b>	<b>18</b>	<b>17</b>	<b>14</b>	<b>13</b>
72	Flavour	9	7	5	4
	Body & Texture	4	5	5	5
	Appearance	5	3	3	3
	<b>Total</b>	<b>18</b>	<b>15</b>	<b>13</b>	<b>12</b>
96	Flavour	8	6	5	3
	Body & Texture	4	5	5	5
	Appearance	4	3	3	2
	<b>Total</b>	<b>16</b>	<b>14</b>	<b>13</b>	<b>10</b>
120	Flavour	8	6	4	2
	Body & Texture	4	5	5	4
	Appearance	4	3	3	2
	<b>Total</b>	<b>16</b>	<b>14</b>	<b>12</b>	<b>8</b>
144	Flavour	7	5	4	1
	Body & Texture	4	4	5	3
	Appearance	4	3	2	2
	<b>Total</b>	<b>15</b>	<b>12</b>	<b>11</b>	<b>6</b>

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## کاریگە ھەوینی بە پێک ھێنەبوو لە سەر جواریەتی ماستی کوردی لە بەرھەمە شێرەمەنیە ترشینراوەکان

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### پوختە

ماستی بەرھەمیکی ڕەسنە لە بەرھەمە شێرەمەنیە ترشینراوەکانە کە لە لایەکی کوردستان بەرھەم نەھینریت، وە لە بارودۆخی ھەلگرتنی دا ماست توشی زێدەترشی دەبیێت بەھۆی پێک ھێنەبوو کردنی ماست بەرھەمەنیرا بەریگای تاییەتی دروست کردنی ماستی کوردی وە بە بەکارھێنانی ھەوینی ماستی سلیمانی کە بەکتریای ترشی لاکتیک و پێکی تێدایو، وە پێچواری جوور کە ھەوینیە کە دابەشی کرا بۆ چوار بەشی. بەشی یەکەم وەک ھۆکاریەتی کۆنترۆل (معاملە) کە گەرم نەکراوە (3) سە ھەشەکەمی تر گەرم کرا لە رێی گەرمای ناوی گەرم بە پلەی 60° س بۆ ماوەی 10 دەقیقە و 65° س بۆ ماوەی 10 دەقیقە و 65° س بۆ ماوەی 20 دەقیقە.

دەرئەنجام دەرکەوت کە ماستی ھەوینی گەرم نەکراو (ھۆکاریەتی کۆنترۆل) زۆرترین ژمارەیی خانەیی پێکی تێدا بوو (100٪) وە ماستی ھۆکاریەتی گەرمی 65° س بۆ ماوەی 20 دەقیقە کە مەترین ژمارەیی پێکی تێدا بوو (0.3٪). وەھەرھوھا ماستی ھۆکاریەتی گەرمی 65° س بۆ ماوەی 10 دەقیقە و 20 دەقیقە باشترین جووری ماست دەرکەوت لە نەنجامی تیشتی ھەستیاری بە بەراوردکردنی لە گەن ھۆکاریەتیەکانی تر.

## تأثير البادئ الملوث بالخميرة على نوعية المنتج اللبني الكردي المتخمر (الماست)

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### الخلاصة

الماست هو النوع التقليدي من اللبن المتخمر الذي ينتج في كردستان من قبل القرويين. تحت ظروف الخزن يعاني الماست من الحموضة الحادة بفعل الخميرة. تم استخدام الطريقة التقليدية لإنتاج الماست باستخدام الماست المحلي في مدينة السليمانية كبداية الذي يحتوي على بكتريا حامض اللاكتيك مع الخميرة الملوثة له. قسم البادئ الى اربعة اقسام، القسم الاول اعتبر كمعاملة سيطرة والاقسام الثلاثة الاخرى عوملت بالحرارة في الحمام المائي بدرجة (60 م°/10 دقيقة، 65 م°/10 دقيقة و 65 م°/20 دقيقة على التوالي. بينت التجربة ان معاملة السيطرة تحتوي على اعلى عدد من خلايا الخميرة (100%) وكان البادئ المعامل بدرجة 65 م°/20 دقيقة يمتلك اقل عدد من الخميرة (0.3%). فيما البادئ المعامل بدرجة 65 م°/10 و 20 دقيقة قد اعطى افضل نوعية من الماست اعتمادا على الفحوصات الحسية وبالمقارنة مع بقية المعاملات.

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