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Influence of Cumin and Thyme Aqueous Extracts on the Activity of some Starter Cultures.

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ABSTRACT

Two spices aqueous extracts (cumin and thyme) at zero, 0.5, 1, 2, 3, 4 and 5% concentrations were investigated for their influence on the activity of some starter cultures. *Lactococcus lactis subsp cremoris, Lactococcus lactis subsp lactis, Lactococcus lactis subsp diacetylactis, Lactobacillius casei* and yoghurt starter (*Lactobacillus delbrueckii subsp bulgaricus& Streptococcus thermophilus*) were used. Each culture was examined in reconstitute skim milk containing spices aqueous extract. Freshly grown cultures were used as control. Regarding to cumin, *Lactococcus lactis subsp lactis* gave the highest acidity of 1.32 %, followed by *Lactobacillius casei* (1.08%), yoghurt starter (1.07 %), *Lactococcus lactis subsp diacetylactis* (1.07 %), whereas the lowest acidity of 1.01 %, was detected for *Lactococcus lactis subsp cremoris* after 48 h at 5% cumin aqueous extract, while respecting to thyme extract, it was 1.03, 1.02, 1.0, 1.0 and 0.97 % for yoghurt starter, *Lactococcus lactis subsp cremoris, Lactococcus lactis subsp lactis, Lactobacillius casei* and *Lactococcus lactis subsp diacetylactis* after 48 h with 5% thyme aqueous extracts, respectively . The highest bacterial growth rate in cumin extract were found with *Lactococcus lactis subsp lactis* (187.5×10^6cfu/g) while the lowest were found with *Lactococcus lactis subsp diacetylactis* (100×10^6cfu/g), while in thyme extract the highest bacterial count in *Lactococcus lactis subsp diacetylactis* (135×10^6cfu/g) and the lowest one was *Lactococcus lactis subsp lactis* (103×10^6cfu/ml).

Keywords: spices, aqueous extract, starter culture, yoghurt starter.

INTRODUCTION

Spices were used for many centuries ago at different regions of the world to enhance aroma and flavor of foods. Spices have been used for a long times ago to preserve food and for treatment of diseases. The derived products of plants used for medicinal treatments for many centuries. Plant-derived products have been used for medical treatments for centuries at present. About 80% of the world's population relies on plant preparations for the treatment of various diseases, without any side effects (Joe *et al*., 2009). Spices have antimicrobial substances that are widely used to extend shelf life and maintain foods for a long period of time (Eyassu, 2013). Bakirci (1999) studied the effects of Thymus sp. on acid production by *Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp bulgaricus* at the end of the fermentation period. Increasing the concentrations of the Thymus sp. resulted in reduction of the pH values and increasing in the titratable acidity. The effect of herb ratios on the pH was found significant at concentration of 1 and 2% herby media. Abou Ayana &Gamal El Deen, (2011) and Khaleel,(2000) stated that the addition of some aromatic and essential oils to yoghurt and labneh had a positive stimulatory effects on lactic acid bacteria through enhancing their counts and subsequently acid production. El-Nawawy *et al*., (1998) confirmed that presence of thyme, in the manufacture of yoghurt resulted in an increase of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* counts, compared to yoghurt without thyme during storage period. Shipradeep *et al.,* (2012) revealed that essential oils of some medicinal plants have very high minimal inhibitory concentration (MIC) against the beneficial probiotic bacteria. On the other hand, it has much lower concentration against the pathogenic bacteria. Kivanc *et al.,* (1991) mentioned that both of Lactobacillus *plantarum* and *Leuconosto cmesentroides* are relatively resistant to inhibitory effect of some spices and its derivatives, while some spices have stimulatory effect on these microorganisms resulting in an increase of acid production. Kozłowska *et al*., (2015) mentioned that cumin seed extract has significant effect against *lactobacillus. delbrueckii subsp. bulgaricus (ATCC 11842* and *LB58).* Addition of 0.5, 1.0 and 2.0% w/w of cumin extract and 150, 300 and 600 ppm of cumin essential oil stimulated the growth of *Lactobacillus plantarum* and *Leuconostoc mesenteroides*. (de-Souza *et al*., 2005). Al-Otaibi and El-Demerdash (2008) found that the total viable counts of *Streptococcus thermophilus* and *Lactobacillus delbrueckii ssp. Bulgaricus* in labneh manufactured by adding 0.2 ppm of thyme oil increased and it reached the maximum viable counts after 7 days of storage period and it decreased gradually until the end of the storage period.

The aim of this study was to throw light on the effect of some spices aqueous extracts on certain bacterial starter cultures activity.

MATERIALS AND METHODS

Five starter cultures used in this study were *Lactococcus lactis subsp cremoris, Lactococcus lactis subsp lactis, Lactococcus lactis subsp diacetylactis, Lactobacillius casei* and yoghurt starter (*Lactobacillus delbrueckii subsp bulgaricus& Streptococcus thermophilus*).These strains were provided by the Dairy science Department, Faculty of Agriculture, Assiut University.Thyme and cumin seeds were obtained from local market at Assiut city. Fresh raw buffalo's milk was obtained from Misr El- Khair farm, Arab El-Awamer, Abnoub, Assuit. Skim milk powder was obtained from (Nestle, Belgomilk, Frieslandcampina) local market at Assiut city.

Spices aqueous extracts were perpetrated according to the method of El-Mesery, (2010). Ten grams of cleaned dried seeds was soaked in 100 ml boiled water with stirring for 2 h then allowed to stand in the refrigerator at 5±2°C overnight, then filtered through a four-layer of cloth cheese and re-filtered through filter paper.

10% skim milk powder was dissolved in distilled water and used as a fermentation medium, according to (Bakirci, 1999). The spices aqueous extracts were added aseptically into the flasks (control), 0.5, 1.0, 2.0, 3.0, 4.0 and 5.0% V/V. incubation was carried out at 37°C until coagulation then transferred to refrigerator at 5±2°C.

Titratable acidity was estimated according to A.O.A.C (2000). Lactic acid bacteria (L.A.B) in samples were counted using MRS Agar medium (Difco 1998).

The obtained data were statistical by analyzed computer using the SPSS package (SPSS 1998).

RESULTS AND DISCUSSION

Acid production percentages as lactic acid using yoghurt starter culture in the presence of cumin and thyme extracts at different concentrations at (zero time), 24 h and 48 h is shown in Table (1). It was found that by increasing of the added extract, the acid production increased with high significant differences at (F-test, $p<0.01$) between treatments, and it was increased from 0.31% at control to 0.85% and 0.79 % at 5% cumin and thyme extract, respectively.

Table 1. Acid production by yoghurt starter in the presence of cumin and thyme extracts at different concentrations.

Treatments	Cumin			Thyme		
	Zero time	24 h	48 h	Zero time	24 h	48 h
Control	0.31 ± 0.01^{f}	0.47 ± 0.009^{f}	0.56 ± 0.02^{g}	0.31 ± 0.015^{g}	0.47 ± 0.015^{f}	0.56 ± 0.025^{f}
0.5 %	0.316 ± 0.015^{f}	0.48 ± 0.015^{f}	0.61 ± 0.02^{f}	0.36 ± 0.019^{f}	0.51 ± 0.015^{e}	0.67 ± 0.025^{e}
1%	0.4 ± 0.015^{e}	0.57 ± 0.025^{e}	0.75 ± 0.02^{e}	0.4 ± 0.009^{e}	0.62 ± 0.025^{d}	0.77 ± 0.025^{d}
2%	0.48 ± 0.015^{d}	0.61 ± 0.015^{d}	0.87 ± 0.025^{d}	0.5 ± 0.011^{d}	0.77 ± 0.025^{c}	0.89 ± 0.015^{c}
3%	0.6 ± 0.02^{c}	0.72 ± 0.025^{c}	0.92 ± 0.025^{c}	0.6 ± 0.025^{c}	0.87 ± 0.026^{b}	0.97 ± 0.025^{b}
4%	0.72 ± 0.019^{b}	0.97 ± 0.025^{b}	1.03 ± 0.019^{b}	0.68 ± 0.01^{b}	0.97 ± 0.025^{a}	1.01 ± 0.03^{a}
5%	0.85 ± 0.025^{a}	1 ± 0.025^{a}	1.07 ± 0.025^{a}	0.79 ± 0.06^{a}	1 ± 0.02^{a}	1.03 ± 0.02^{a}
F-test	**	**	**	**	**	**
LSD 0.05	0.031	0.036	0.039	0.035	0.039	0.024
LSD 0.01	0.043	0.051	0.055	0.048	0.054	0.059

In the same column, means with the same letter are not significantly different ($p<0.05$) *: Significant **:Highly Significant

After 24 and 48 hours of cold storage acidity as lactic acid were increased by increasing the aqueous extracts in both spices at different concentration.

Regarding the effect of cumin and thyme extracts on growth rate of yoghurt starter culture, it was noticed from Table (2) that cumin and thyme extracts stimulated the growth rate of yoghurt starter. Increasing the concentration of added extracts caused gradual increase in the bacterial counts which raised from 102×10^6 in control to $106.5\times10^6$and 119×10^6 cfu/ml at 5% cumin and thyme extract, respectively. Stored culture at refrigeration temperature resulted in an increase in their bacterial counts, either with cumin or thyme extracts, and it reached 106.5×10^6 for control and increased to reach 120×10^6 and 125×10^6cfu/ml after 48h for cumin and thyme extracts, respectively. These results are in accordance with those reporting by Bakirci (1999), Abou Ayana &Gamal El Deen, (2011) , Khaleel,(2000) and El-Nawawy *et al*., (1998).

Table 2. Effect of cumin and thyme extracts on growth rate of yoghurt starter

Treatments	Cfu/g					
	Cumin			Thyme		
	0.0 h	24 h	48 h	0.0 h	24 h	48 h
Control	102×10^6	105×10^6	106.5×10^6	102×10^6	105×10^6	106.5×10^6
0.5 %	102×10^6	106×10^6	107.5×10^6	105×10^6	106×10^6	108×10^6
1%	103×10^6	107×10^6	109×10^6	107×10^6	107×10^6	109×10^6
2%	104×10^6	109.5×10^6	110×10^6	109×10^6	111.5×10^6	112.5×10^6
3%	105×10^6	110×10^6	113×10^6	114×10^6	115.5×10^6	116×10^6
4%	106×10^6	111.5×10^6	115×10^6	116×10^6	118.5×10^6	122×10^6
5%	106.5×10^6	112.5×10^6	120×10^6	119×10^6	121×10^6	125×10^6

Table (3) showed the acid production by *Lactococcus lactis subsp lactis* in presence of cumin and thyme extracts at different concentrations. High significant differences (F-test, $p<0.01$) were found among most concentrations of both cumin and thyme extracts. Acidity increased by increasing the concentration of added extract, which reached 1.32 and 1.0% at 5% of cumin and thyme extracts after 48 h of cold storage. It was also observed that the increase in acidity was higher in the case of cumin using 5% after 48h storage than that when using thyme with the same concentrations.

Table (4) showed the growth rate of *Lactococcus lactis subsp lactis* at different concentrations of cumin and thyme extract. It was noticed that bacterial total counts at both of cumin and thyme extracts increased to reach the highest total counts number in the case of adding 5% cumin extract after 48h storage ($187.5.\times10^6$ cfu/g).

High significant differences (F-test, $p<0.01$) were found among concentrations due to the acid production of *Lactococcus lactis subsp cremoris* as shown in Table (5). Acidity was 0.32% in control sample and reached to 0.69% at 5% cumin extract, and in the same respect, it raised from 0.32% to 0.72% in thyme extract. Also noticeable increase was observed in acidity production after 24 and 48h storage in both cumin and thyme.

Table (6) throws light on the effect of cumin and thyme extract on the growth rate of *Lactococcus lactis subsp cremoris*. An increase of bacterial growth rate was observed, which reached 55×10^6cfu/g in control at zero time, and 98×10^6 and 100×10^6cfu/g at 5% cumin and thyme extract after 24 h storage, respectively. After 48h of cold storage it was noticed that a noticeably increase was observed in bacterial counts in both two spices at all treatments.

Table 3. Acid production by *Lactococcus lactis subsp lactis* in the presence of cumin and thyme extracts at different concentrations.

Treatments	Cumin			Thyme		
	zero time	24 h	48 h	zero time	24 h	48 h
Control	0.33±0.015^{f}	0.43±0.009^{f}	0.57±0.015^{f}	0.33±0.019^{g}	0.43±0.01^{f}	0.57±0.015^{f}
0.5 %	0.46±0.04^{e}	0.61±0.01^{e}	0.71±0.015^{e}	0.4±0.009^{f}	0.52±0.025^{e}	0.61±0.02^{e}
1%	0.59±0.015^{d}	0.87±0.015^{d}	0.91±0.015^{d}	0.47±0.02^{e}	0.62±0.025^{d}	0.72±0.025^{d}
2%	0.69±0.05^{c}	0.89±0.015^{d}	0.93±0.002^{d}	0.51±0.01^{d}	0.76±0.015^{c}	0.81±0.015^{c}
3%	0.8±0.02^{b}	0.98±0.015^{c}	1.02±0.0025^{c}	0.6±0.02^{c}	0.89±0.025^{b}	0.97±0.025^{b}
4%	0.82±0.02^{b}	1.08±0.015^{b}	1.13±0.0061^{b}	0.74±0.015^{b}	0.93±0.026^{b}	0.98±0.02^{b}
5%	0.93±0.015^{a}	1.13±0.05^{a}	1.32±0.006^{a}	0.82±0.02^{a}	1±0.02^{a}	1±0.02^{a}
F-test	**	**	**	**	**	**
LSD 0.05	0.42	0.04	0.06	0.03	0.038	0.036
LSD 0.01	0.059	0.056	0.08	0.042	0.053	0.05

In the same column, means with the same letter are not significantly different (p<0.05) *: Significant **: Highly Significan

Table 4. Effect of cumin and thyme extracts on growth rate of *Lactococcus lactis Subsp lactis.*

Treatments	Cfu/g					
	Cumin			thyme		
	0.0 h	24 h	48 h	0.0 h	24 h	48 h
Control	80×10^{6}	95×10^{6}	98.5×10^{6}	80×10^{6}	95×10^{6}	98.5×10^{6}
0.5 %	82×10^{6}	99×10^{6}	107.5×10^{6}	81×10^{6}	82×10^{6}	83×10^{6}
1%	84×10^{6}	110×10^{6}	115×10^{6}	83×10^{6}	86.5×10^{6}	87×10^{6}
2%	85×10^{6}	128×10^{6}	135×10^{6}	86×10^{6}	89×10^{6}	91×10^{6}
3%	89×10^{6}	135×10^{6}	137×10^{6}	93×10^{6}	94.5×10^{6}	96.5×10^{6}
4%	91×10^{6}	165×10^{6}	177×10^{6}	95×10^{6}	97×10^{6}	99.5×10^{6}
5%	93×10^{6}	171×10^{6}	187.5×10^{6}	97.5×10^{6}	99.5×10^{6}	103×10^{6}

Table 5. Acid production by *Lactococcuslactis sub sp cremoris* in presenc of cumin and thyme extracts at different concentrations.

Treatments	Cumin			Thyme		
	zero time	24 h	48 h	zero time	24 h	48 h
Control	0.32±0.015^{e}	0.45±0.009^{f}	0.52±0.015^{f}	0.32±0.025^{e}	0.45±0.01^{e}	0.52±0.02^{f}
0.5 %	0.45±0.025^{d}	0.61±0.015^{e}	0.68±0.05^{e}	0.37±0.025^{d}	0.5±0.011^{d}	0.6±0.01^{e}
1%	0.48±0.03^{d}	0.67±0.015^{d}	0.71±0.02^{d}	0.39±0.015^{d}	0.53±0.01^{d}	0.68±0.03^{d}
2%	0.52±0.02^{c}	0.71±0.015^{c}	0.73±0.02^{d}	0.49±0.015^{c}	0.64±0.01^{c}	0.77±0.02^{c}
3%	0.52±0.025^{c}	0.72±0.02^{c}	0.84±0.01^{c}	0.51±0.051^{c}	0.67±0.02^{c}	0.88±0.03^{b}
4%	0.6±0.015^{b}	0.81±0.015^{b}	0.93±0.02^{b}	0.6±0.025^{b}	0.87±0.02^{b}	1±0.02^{a}
5%	0.69±0.015^{a}	0.93±0.03^{a}	1.01±0.015^{a}	0.72±0.025^{a}	0.98±0.02^{a}	1.02±0.025^{a}
F-test	**	**	**	**	**	**
LSD 0.05	0.038	0.03	0.03	0.036	0.03	0.042
LSD 0.01	0.052	0.04	0.04	0.051	0.04	0.059

In the same column, means with the same letter are not significantly different (p<0.05) *: Significant **: Highly Significant

Table 6. Effect of cumin and thyme extracts on growth rate of *Lactococcus lactis susp cremoris.*

Treatments	Cfu/g					
	Cumin			Thyme		
	0.0 h	24 h	48 h	0.0 h	24 h	48 h
Control	55×10^{6}	70×10^{6}	77.5×10^{6}	55×10^{6}	70×10^{6}	77.5×10^{6}
0.5 %	59×10^{6}	60×10^{6}	88×10^{6}	58×10^{6}	81×10^{6}	83.5×10^{6}
1%	66×10^{6}	76.5×10^{6}	89.5×10^{6}	60×10^{6}	88×10^{6}	89×10^{6}
2%	71×10^{6}	84×10^{6}	90×10^{6}	65×10^{6}	90×10^{6}	93.5×10^{6}
3%	76×10^{6}	88×10^{6}	94×10^{6}	68×10^{6}	96.5×10^{6}	98×10^{6}
4%	77×10^{6}	91×10^{6}	97×10^{6}	70×10^{6}	99×10^{6}	102×10^{6}
5%	81×10^{6}	98×10^{6}	105×10^{6}	71.5×10^{6}	100×10^{6}	109.5×10^{6}

Table (7) illustrates the acid production by using *Lactobacillus casei.* A high significant differences at (F-test, p<0.01) were found among the most treatments, and the acidity was 0.29 in control and increased to 0.49 % in 5% cumin extract. In the same manner it recorded 0.29 of control and increased to reach 0.51% for thyme extract at 5% after zero time. In the same respect, after 48h, acidity content raised from 0.57 to 1.08% and from 0.57 to 1% of cumin and thyme, respectively.

From Table (8) it was concluded that the addition of cumin and thyme extracts had positive simulative effects on the growth rate of *Lactobacillus casei.* In the case of cumin extract treatments the total bacterial counts increased by increasing of cumin concentration, either after 24 hours or after 48 hours storage. The same results were also noticed in the case of thyme treatments.

Results in Table (9) showed the acid produced by *Lactococcus lactis subsp diacetylactis* in the presence of

cumin and thyme extracts at different concentrations. The obtained results showed that *Lactococcus lactis subsp diacetylactis* culture was stimulated by addition of cumin and thyme extracts an dits acidity production was gradual increased by increasing the two spices percentages.

Table 7. Acid production by *Lactobacillus casei* in presence of cumin and thyme extracts at different concentrations.

Treatments	Cumin			Thyme		
	zero time	24 h	48 h	zero time	24 h	48 h
Control	0.29±0.015^{f}	0.41±0.01^{g}	0.57±0.025^{e}	0.29±0.011^{d}	0.41±0.025^{f}	0.57±0.02^{f}
0.5 %	0.33±0.015^{e}	0.48±0.015^{f}	0.6±0.02^{e}	0.32±0.02^{d}	0.46±0.009^{ef}	0.68±0.015^{e}
1%	0.37±0.02^{d}	0.52±0.02^{e}	0.75±0.02^{d}	0.32±0.02^{d}	0.47±0.025^{e}	0.69±0.025^{e}
2%	0.39±0.01^{cd}	0.56±0.009^{d}	0.87±0.025^{c}	0.36±0.015^{c}	0.58±0.015^{d}	0.72±0.025^{d}
3%	0.41±0.015^{c}	0.62±0.026^{c}	0.09±0.02^{c}	0.41±0.01^{d}	0.62±0.025^{c}	0.88±0.015^{c}
4%	0.46±0.015^{b}	0.67±0.025^{b}	1±0.015^{b}	0.42±0.02^{d}	0.67±0.025^{b}	0.99±0.03^{b}
5%	0.49±0.015^{a}	0.72±0.026^{a}	1.08±0.026^{a}	0.51±0.009^{a}	0.87±0.02^{a}	1±0.02^{a}
F-test	**	**	**	**	**	**
LSD 0.05	0.027	0.035	0.038	0.029	0.038	0.039
LSD 0.01	0.037	0.049	0.054	0.041	0.052	0.054

In the same column, means with the same letter are not significantly different (p<0.05) *: Significant **: Highly Significant

Table 8. Effect of cumin and thyme extracts on growth rate of *Lactobacillus casei.*

Treatments	Cfu/g					
	Cumin			Thyme		
	0.0 h	24 h	48 h	0.0 h	24 h	48 h
Control	90×10^{6}	93×10^{6}	96×10^{6}	90×10^{6}	93×10^{6}	96×10^{6}
0.5 %	91×10^{6}	97×10^{6}	99×10^{6}	97×10^{6}	110×10^{6}	115×10^{6}
1%	93×10^{6}	100×10^{6}	101×10^{6}	102×10^{6}	113.5×10^{6}	117.5×10^{6}
2%	95×10^{6}	101.5×10^{6}	103×10^{6}	107×10^{6}	115.5×10^{6}	119.5×10^{6}
3%	97×10^{6}	103.5×10^{6}	107.5×10^{6}	110×10^{6}	117×10^{6}	120.5×10^{6}
4%	101×10^{6}	107.5×10^{6}	111×10^{6}	113×10^{6}	120×10^{6}	127×10^{6}
5%	105×10^{6}	113.5×10^{6}	117×10^{6}	120×10^{6}	132.5×10^{6}	133×10^{6}

Table 9. Acid production by *Lactococcus lactis subsp diacetylactis* in presence of cumin and thyme extracts at different concentrations.

Treatments	Cumin			Thyme		
	zero time	24 h	48 h	zero time	24 h	48 h
Control	0.29±0.01^{e}	0.39±0.015^{f}	0.52±0.025^{f}	0.29±0.005^{f}	0.39±0.01^{f}	0.52±0.02^{f}
0.5 %	0.31±0.01^{e}	0.45±0.01^{e}	0.58±0.015^{e}	0.33±0.01^{ef}	0.44±0.02^{e}	0.55±0.009^{f}
1%	0.34±0.01^{d}	0.49±0.015^{d}	0.61±0.015^{d}	0.35±0.009^{e}	0.48±0.02^{de}	0.61±0.01^{e}
2%	0.37±0.019^{c}	0.52±0.025^{d}	0.72±0.025^{d}	0.37±0.015^{d}	0.51±0.015^{d}	0.69±0.01^{d}
3%	0.4±0.01^{b}	0.62±0.026^{c}	0.87±0.026^{c}	0.4±0.02^{c}	0.61±0.03^{c}	0.77±0.02^{c}
4%	0.42±0.019^{b}	0.67±0.025^{b}	1.02±0.026^{b}	0.44±0.015^{b}	0.8±0.021^{b}	0.88±0.01^{b}
5%	0.52±0.025^{a}	0.77±0.025^{a}	1.07±0.025^{a}	0.47±0.015^{a}	0.87±0.025^{a}	0.97±0.025^{a}
F-test	**	**	**	**	**	**
LSD 0.05	0.028	0.037	0.04	0.024	0.04	0.03
LSD 0.01	0.039	0.05	0.056	0.033	0.05	0.04

In the same column, means with the same letter are not significantly different (p<0.05) *: Significant **: Highly Significant

Table 10. Effect of cumin and thyme extracts on growth rate of *Lactococcus lactis Subsp diacetylactis.*

Treatments	Cfu/g					
	Cumin			Thyme		
	0.0 h	24 h	48 h	0.0 h	24 h	48 h
Control	60×10^{6}	65.5×10^{6}	80.5×10^{6}	60×10^{6}	65.5×10^{6}	80.5×10^{6}
0.5 %	63×10^{6}	66.5×10^{6}	83×10^{6}	65×10^{6}	76×10^{6}	78×10^{6}
1%	67×10^{6}	70×10^{6}	87.5×10^{6}	70×10^{6}	80×10^{6}	92×10^{6}
2%	69×10^{6}	73×10^{6}	90.5×10^{6}	85×10^{6}	96×10^{6}	99×10^{6}
3%	73×10^{6}	79×10^{6}	93×10^{6}	93×10^{6}	102×10^{6}	105×10^{6}
4%	80×10^{6}	85.5×10^{6}	96.5×10^{6}	101×10^{6}	113.5×10^{6}	125×10^{6}
5%	88×10^{6}	95.5×10^{6}	100×10^{6}	108×10^{6}	119.5×10^{6}	135×10^{6}

Acidity content of 0.29 was detected in control, and gradually increased to reach 0.52% and 0.47% at 5% cumin and thyme extract at zero time, with high significant differences (F-test, p<0.01) among treatments. Obtained data also illustrate that a gradual increase occurred during storage and values raised from 0.52 for control to 1.07% and 0.97% at 5% cumin and thyme extract after 48h storage with high significant differences (F-test, p<0.01) among treatments.

Growth rate of *Lactococcus lactis subsp diacetylactis* was determined in Table (10) data showed that both cumin and thyme extracts had stimulatory effects at all percentages added. The maximum number of total bacterial counts of *Lactococcus lactis subsp*

diacetylactis was recorded after 48h at 5% thyme extract, which was 135×10^6cfu.

All above results are in accordance with those reported by Bakirci (1999), Abou Ayana &Gamal El Deen, (2011), Khaleel,(2000) , El-Nawawy*et al*., (1998) ,(de-Souza *et al*., 2005) and Al-Otaibi & El-Demerdash (2008)

CONCLUSION

From this investigation it can be concluded that the use of cumin and thyme aqueous extract spices have a good stimulatory effects on lactic acid bacteria which applied in dairy industries as starter cultures or probiotics in both a viable bacterial cell counts and acid productions hence, enhance the quality of some fermented dairy products.

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نشاط إضافة بعض مستخلصات التوابل المائية علي نشاط بعض مزارع البادئات.

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تم دراسة المستخلص المائي لنوعين من توابل الكمون و الزعتر من حيث تأثيره على نشاط بعض مزارع البادئات التالية : Yoghurt starter (*Lactobacillus delbrueckiisubspbulgaricus & Streptococcus salivariussubspthermophillus*).*Lactococcus lactis subsp cremoris, Lactococcus lactis subsp lactis, Lactococcus lacti ssubsp diacetylactis and Lactobacillius casei* اجريت الدراسة على كل مزرعة منفصلة في بيئة التخمر باستخدام لبن فرز مسترجع و التي تحوي المستخلص المائي للتابل .استخدمت المزارع حديثة التلقيح -بدون المستخلص كعينة مقارنة واوضحت نتائج الدراسة ان اضافة مستخلص الكمون الي بكتيريا *Lactococcus lactis subsp lactis* عمل علي تنشيطها و انتجت اعلى كمية حمض بلغت ١.٣٢ % يليه *Lactobacillus casei* بنسبة حموضة بلغت١.٠٨% ثم تلاها كل من بادئ الزبادي و *Lactococcuslactissu subsp diacetylactis* بنسبة حموضة بلغت ١.٠٧ % بعد ٤٨ ساعة علي درجة حرارة الثلاجة باضافة ٥ % مستخلص كمون اما بالنسبة لمستخلص الزعتر فكانت نسب الحموضة علي النحو التالي ١.٠٣, ١.٠٢ ،١.٠٠,١.٠٤ و ٠.٩٧ % لـ بادئ الزبادي و *Lactococcuslactis subsp cremoris* و *Lactococcus lactis subsp lactis* و *Lactobacillus casei* و *Lactococcus lactis subsp diacetylactis* علي التوالي.كما دلت النتائج علي ان أعلى معدل نمو بكتيري بالنسبة لمستخلص الكمون كانت لبكتيريا *Lactococcus lactis subsp lactis* و(١٨٧.٥ × ١٠٦) وحدة مكونه للمستعمرة/جرام (بينما كانت أقلهم للـ 100×10^6) وحدة مكونه للمستعمرة/جرام لبكتيريا *Lactococcus lactis subspd iacetylactis* بعد ٤٨ ساعة علي حراة الثلاجة باستخدام ٥% مستخلص كمون . بينما في مستخلص الزعتر كان أعلى معدل نمو بكتيري للـ 135×10^6 *Lactococcus lactis subsp diacety lactis* وحدة مكون للمستعمرة/جرام بينما كان أقلهم لبكتيريا *Lactococcus lactis subsp lactis* بمعدل ١٠٣ × ١٠٦ وحدة مكونة للمستعمرة/ جرام.