EXTEND THE SHELF LIFE AND IMPROVING SENSORY PROPERTIES OF WHITE SOFT CHEESE BY ADDING CELERY LEAVES

J. M. awda 1 H. A. Awad 2 M. A. Alssirag 3 D. A. Alfalahi 4
Assist. Lecturer Lecturer Assist. prof. Lecturer
1,2,3.. Karbala University, Animal Production, Agriculture Collage, Karbala, Iraq.
4Dept. Food sc., Coll. Agric. Engine. Sc.,University of Baghdad
dr.haifa70gmail.com jasim.awda@coagri.uobaghdad.edu.iq

ABSTRACT
This study was aimed to investigate the effect of addition different concentration of celery leaves to white soft cheese, Treated cheese between 2018-2019, The finely Celery (Apium graveolens) leaves were adding to crude white cheese after texturizing in three levels included (A,B,C) in addition of control antimicrobial activity of celery treated cheese against total account bacteria and coliform bacteria was estimated during (0, 5, 10, 15, 20) days. The results were shown that the higher concentration of celery in treated cheese, had a lower concentration of protein, lipid and ash content (16.81,15.13 and 4.30% respectively, but it had a higher moisture content 59.50%).also the total bacteria counts were decreasing significantly (0.05 P) with accumulative of cheese during astorage periods, it was reached to 1.3x10^5, 9.5x10^3, 9x10^3, 7.62x10^3 , 1.05x10^4 (cfu/g) respectively comparing with control samples, the number of coliform bacterial in celery treated cheese, at concentrations 15% was achieved significant difference comparing with other samples (8x10^3,10.2x10^4, 9.7x10^4 , 8.9x10^3, 9.5x10^3 (log cfu/g) respectively.

Key word: apium gravioules, sensory evaluation, bacteria, lipid.

*Received:15/3/2019, Accepted:7/7/2019
INTRODUCTION
Food preservatives very effected for degreasing the food damages, improving and achieved good destruction. The preservatives have continues interesting to used, but must to be safe for human combustion (11) Polyphenols are one of the major antioxidant in human and its derived from plants, it's really appear a wide organic occupation, including antioxidant, apoptosis, antiaging, anticancer, in addition to inhibitor of angiogenesis and cell propagation accomplishments (14). Cheese is the famous food in the worldwide. Its production from milk by different ways and technologies enables. Because the delicious test, it is rich with proteins, and considered a healthy food (24) its utilization has amplified in latest years. .cheeses are very suggestible to infectivity by pathogenic and spoilage microbes, which can shrinkage the shelf life, causing recollections, leading to a peril to the consumer’s health. Among pathogens, L. monocytogenes, Stap. aureus, and Salmonella spp. are regulary correlated with food eruptions from the utilization of cheese (15).Equally, determined by the unease about health and well-being, punters have claimed securer and healthful food, free of artificial additives, which are regularly reflected unsafe and carcinogenic materials (21). So as to converse the new requisiments from More lately, because of the probable antimicrobial cause they have appealed the enlarged interest of food experts and technicians as natural preservatives (12). Herbs are generally organized as ingredients Generally Recognized as Safe (10). The natural components must have high stability when it is adding to food. Sometime the natural compounds normally irritable to oxygen, light, temperature, and pH 8, and can be loss below managing of cheese(19) observed a reduction inside the component matter of Ocimum basilicum (basil) and Tanacetum vulgare (tansy) enhanced through cheese preparation. comparably (20) registered that 37.49% of the rosemary whole volatiles of (Rosmarinus officinalis) enhanced to sheep milk were misplaced through cheese makinh, so, the attention of plant excerpts (Rosmarinus officinalis) to exist limited for amalgamation into cheese should provide the probable in food preparation , so as to support acceptable microbiological reticence (15, 20,32,33). The main aim of this study was to analysis the influence of the addition Celery to the white soft cheese on microbial population to improvement the sensory properities of the treated cheese.

MATERIALS AND METHODS
Preparation of the soft cheese combined with celery (Apium graveolens) Leaf.
A composition analysis of fresh cow’s milk was performed by using a milk analyzer (Lacto Flash, Gerber, Germany). The milk was emptied in a antiseptic cheese-formulating container at 90 C’ for 2sec, then cooling down the milk to 45C. Celery leaves cut finely and soaked in water 75C° at to become withers and easy to mixing with the raw milk, Then it adding in the level 5, 10 and 15% namely A,B,C respectively . 0.002 % of microbial Rennet (Microbial Meito Rennet, Japan) was supplemented to the milk. incubated with room temperature, and the coagulates were removed in to antiseptic mesh for lack of moisture and filtration for 2 hr at room temperature. IN the end of the dehydration periods, the cutting and shaping of coagulates were completed. Cheeses were transferred into antiseptic vessels and apportioned in to pieces, The first piece was used to study sensory and the second piece to study microbial evaluation, Then stored at 4°C for two days for the next experiments:-

Study the sensory properities of prepared cheese incorporated with different concentration of celery leaf (Apium graveolens)
Evaluated factor include, colour , flavor, texture, and overall acceptability that using in sensory evaluation sheet as describes by (19), the sample that examined in the texture tests cheese texture properties (surface roughness, surface moisture, elasticity, and hardness). were cut for getting a suitable cubes (2.5 cm). aimed to measure main The Adjusters were recruited among people living in Baghdad city; they was employer at University of Baghdad (10 potential selected). All the selected were briefed on the scope of the sensory evaluation technique.(18).
Study the antimicrobial activity of prepared cheese incorporated with different concentration of celery leaf
Ten undesirable in food products species, namely Salmonella, Bacillus subtilis, Pseudomonas aeruginosa, E.coli, Lecunostic, Bacillus thermogenesis, Aspergillus niger, Aspergillus sp, Pencillium and Rhizopus oryzae, were selected from the Microbiology Lab – college of agriculture / University of Baghdad and used as test culture. . 0.5 ml of 1.75% Barium Chloride blended with BaCl2.2H2O and completed to 99.5 ml of 1% Sulfuric Acid H2SO4. Turbidity is e to 1 × 108 colony formation unit (CFU) / ml. The colonies of the bacterial pathogen were transported by Equivalent loop to 4 ml of the peptone water and the transport continues until the turbidity of peptone water is equal to the turbidity of McFarland suspension (2). It is evaporated to concentrations from a raw leaves extracts by dissolving 1 g of raw extracts in 10 ml of DMSO to obtain a concentration of 100mg/ml, and dissolving 2 g of extracts in 20 ml of DMSO to get a concentration of 50 mg/ml (5).

RESULTS AND DISCUSSION
Chemical Composition of prepared cheese Incorporated with different levels of Celery. Table 1. show chemical analysis of processed cheese Incorporate with Celery (Apium graveolens) Leaf. There is not significant difference in moisture, Protein, lipid and ash content among all treatments. it was found out that the higher concentration of celery in manufacture cheese, had the lower in the protein, lipid and ash content was 16.81, 15.13 and 4.30% respectively, but had the higher moisture content was 59.50% comparing with control sample was 58.01% . , Protein and other composition content of bovine milk cheese has received increased interest in recent years because an increasing proportion of milk is used for manufactured products such as cheese (7), The scientific research on this subject is few for compared with our results significantly

Table 1. Chemical composition of prepared cheeses with different levels of celery

| Treatment | Moisture | Protein% | Lipid% | Ash% |
|-----------|----------|----------|--------|------|
| Control   | 58.01±0.57a | 17.98±1.43a | 16.28±0.57a | 4.20±0.57a |
| TA        | 58.31±0.57a | 17.95±1.73a | 15.93±0.57a | 4.25±0.57a |
| TB        | 58.17±1.52a | 17.36±1.73a | 15.63±0.57a | 4.27±1.00a |
| TC        | 59.50±1.00a | 16.81±2.30a | 15.13±2.30a | 4.30±0.57a |

Values are given as mean ± standred diviation
Values with similar letters are not significantly various (P<0.05).

TA treatment (5% celery leaves)
TB treatment (10% celery leaves)
TC treatment (15% celery leaves)

Total microbial count ( log cfu/g) of prepared cheese incorporated with different concentration of (Apium graveolens) Celery leaf stored under varied period storage at 4C

Statistically analysis
The data were limited utilizing Duncan’s multiple range test at a level of P 0.05. Statistical assay was worked by (SAS).

Table 2. explain that the overall bacterial calculation reduce constantly through the time of conservation and were affected significantly (P<0.05) with increasing of celery leaf level in the sample during storage at 0,5,10, 20 days were 7.62x10³, 9x10³, 9.5x10³, 1.05x10³, 1.3x10³ (log cfu/g) respectively in (TC) comparing with control Chees samples were 8x10³, 10.2x10⁴, 9.7x10⁴, 8.9x10³, 9.5x10³ (log cfu/g) respectively. This result was agreed with (34). It can be resolved that bioactive complexes in this plant have an antibacterial influence (14). Furthermore, it had been
reported that Trans carbo phyllene has a extremely great antimicrobial ability versus Gram-positive bacteria (15) Overall, the biological ability of plant extract is associated with their chemical constituents, which are depend on plant genotype and disturbed by a number of elements, involving environmental, geographical and agricultural circumstances (16). similar (17) reported a decrease of total count bacteria of traditional turkey cheese.

Table 2. Effect of different concentrations of (Apium graveolens) leaf incorporated with white soft cheese on total count bacterial counts (CFU/g) during storage at 4°C.

| Treatments | Storage Time | 5 days | 10 days | 15 days | 20 days |
|------------|--------------|--------|---------|---------|---------|
| Control    | 8 × 10^4 ± 0.17 | 1.92×10^4 ± 0.48 | 9.7×10^4 ± 0.27 | 8.9×10^4 ± 0.15 | 9.5×10^4 ± 0.26 |
| TA         | 8.3×10^3 ± 0.24 | 9.7×10^3 ± 0.23 | 9.7×10^3 ± 0.26 | 1.8×10^4 ± 0.20 | 6×10^6 ± 0.12 |
| TB         | 7.81×10^3 ± 0.18 | 9.3×10^3 ± 0.17 | 9.3×10^3 ± 0.17 | 1.05×10^4 ± 0.04 | 2.9×10^5 ± 0.11 |
| TC         | 7.56×10^3 ± 0.24 | 9.01×10^3 ± 0.09 | 9.5×10^3 ± 0.16 | 1.05×10^4 ± 0.008 | 1.3×10^5 ± 0.12 |

Values are given as mean ± standard deviation

Sensory estimation of white soft cheese prepared using different concentration of Celery leaf.

Table 4 shows the results for the sensory characteristics estimation of white soft cheese samples prepared using different concentrations (5%, 10%, 15%) of celery leaf. In this study, the parameters tested were texture, color, flavor, strength, bitterness and overall acceptability. The sensory analysis reveals that there is no significant effect of celery leaf addition on sensory attributes of white soft cheese. The white soft cheese prepared with different concentrations of celery leaf was not significantly differed from the control cheese, except for the flavor. The white soft cheese prepared with 5% and 10% of celery leaf had higher scores of flavor and was more acceptable as compared to the control cheese. However, increasing celery leaf concentration did not significantly affect flavor scores of the cheese produced. In general, no significant differences between the treatments and all were acceptable by panelists. Other findings mention that herbs like oregano and rosemary essential oils mention to high defending influence versus lipidoxidation and fermentation in (31). Comparable grades were registered for cheese samples supplemented using various deliberations of rosemary quotation (1).

Table 4. Sensory evaluation to prepared soft white cheese incorporated with different levels of (Apium graveolens) celery leaf

| Treatment | Color | Flavor | Texture | Strength | Overall acceptability | Bitterness | Total Scores |
|-----------|-------|--------|---------|----------|-----------------------|------------|-------------|
| Control   | 10 ± 0.57a | 5 ± 0.57c | 8 ± 0.57a | 10 ± 1.15a | 8 ± 0.57a | 7 ± 0.57b | 48 |
| TA        | 8 ± 0.57b  | 9 ± 1.15ab | 8 ± 0.57a | 9 ± 1.15a | 9 ± 0.57a | 7 ± 0.57b | 50 |
| TB        | 8 ± 0.57b  | 10 ± 1.15a | 7 ± 0.57a | 9 ± 0.57a | 9 ± 1.15a | 10 ± 0.57a | 54 |
| TC        | 7 ± 0.57b  | 7 ± 1.15a | 5 ± 0.57b | 7 ± 0.57b | 7 ± 0.57b | 10 ± 0.57a | 45 |

Means with equal letter have no significant difference.

Coliform count (cfu/g) of prepared cheese incorporated with different concentration of (Apium graveolens) Celery leaf stored under varied period storage at 4°C:

Statistical analysis in table 3. Showed different
effects in the concentrations of ACLE related varying along with CFU/g in white cheese presented that the overall concentrations of ACLE had a significant effect on the growth of Coliform bacterial counts (P < 0.05). The testing of Anova table appeared the growth of Coliform bacterial counts in white soft cheese, with concentrations of 5, 10 and 15% of ACLE (Aquatic Celery liquid Extract) was significantly reduction (P < 0.05) comparing with the control sample (Table 3). The antimicrobial effects of celery, coriander herb and seeds essential oils at concentrations of 0.3, 0.6, 0.9, 10, 50 and 100% were determined in comparison with phenol concentration of 1.0 and 10% against five bacterial strains, two yeast strains and five mold, Therefore reported can used these essential oils as native antimicrobial and antioxidant in industrial food and drugs. As for, the antimicrobial effect of celery and coriander essential oils, it could be related to major component d-Limonene and Linalool, according to (25, 31, 4).

Table 3. Effect of different concentrations of (Apium graveolens) leaf incorporated with white soft cheese on Coliform bacterial counts (CFU/g) during storage at 4°C.

| Treatments | Total Count Bacterial/CFU/g Storage Time |
|------------|----------------------------------------|
| Zero       | 5 days                                 |
| Control    | 9.15x10 ±0.23                          |
| TA         | 5.31x10 ±0.22                          |
| TB         | 3.42x10 ±0.15                          |
| TC         | 2.83x10 ±0.09                          |
| 10 days    | 1.50x10 ±0.14                          |
| 9.50x10 ±0.15 |                                  |
| 8.9x10 ±0.05 |                                  |
| 6.10x10 ±0.11 |                                  |
| 4.08x10 ±0.09 |                                  |
| 9.9x10 ±0.17 |                                  |
| 9.25x10 ±0.06 |                                  |
| 8.44x10 ±0.11 |                                  |
| 5.59x10 ±0.11 |                                  |
| 1.3x10 ² ±0.11 |                                  |
| 2.15x10 ² ±0.08 |                                  |
| 1.73x10 ² ±0.12 |                                  |
| 15 days    | 1.50x10 ±0.14                          |
| 9.50x10 ±0.15 |                                  |
| 8.9x10 ±0.05 |                                  |
| 6.10x10 ±0.11 |                                  |
| 4.08x10 ±0.09 |                                  |
| 9.9x10 ±0.17 |                                  |
| 9.25x10 ±0.06 |                                  |
| 8.44x10 ±0.11 |                                  |
| 5.59x10 ±0.11 |                                  |
| 1.3x10 ² ±0.11 |                                  |
| 2.15x10 ² ±0.08 |                                  |
| 1.73x10 ² ±0.12 |                                  |
| 20 days    | 1.50x10 ±0.14                          |
| 9.50x10 ±0.15 |                                  |
| 8.9x10 ±0.05 |                                  |
| 6.10x10 ±0.11 |                                  |
| 4.08x10 ±0.09 |                                  |
| 9.9x10 ±0.17 |                                  |
| 9.25x10 ±0.06 |                                  |
| 8.44x10 ±0.11 |                                  |
| 5.59x10 ±0.11 |                                  |
| 1.3x10 ² ±0.11 |                                  |
| 2.15x10 ² ±0.08 |                                  |
| 1.73x10 ² ±0.12 |                                  |

Values are given as mean ± standard deviation

LSD to treatments = 0.1729
LSD to times = 0.1933
LSD to correlation = 0.3865

Figer1. Treatment A, B and C of soft white cheese incorporated with different levels of (Apium graveolens) Celery leaf.

Conclusion
This paper indicated that the addition of Celery (Apium graveolens) leaf improved the quality of white soft cheese and affected significantly on flavor and overall acceptance of the final product. These findings suggest that the white soft cheese forfit with Celery (Apium graveolens) is a functional food that can exert antibacterial properties and have verified to be natural preservatives have substantial inhibitory ability versus general microbes.

REFERENCES
1. Abdullah F., Fezea1, Hyder N. Al-Zobaidy1, Muhsin and F. Al-Quraishi1 2017 Total phenolic content, microbial content and Sensory attributes evaluation of white soft cheese incorporated with mint (Mentha Spicata) leaf extract. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 10, Issue 6 Ver. II (June. 2017), PP 36-40.
2. Aggarwal, K. S. Khanuja, A. Ahmad, T. R. Santha, V. G. Kumar, and S. Kumar, 2002. Antimicrobial activity profiles of the two enantiomers of limonene and carvone isolated from the oils of Mentha spicata and Anethum sowa, Flavour and Fragrance Journal, 17(1), 59-63.
3. Alisrrag, M. and R. Ali, 2018. Determination of antimicrobial and antioxidants activity of Salvia przewalskii seed oil against pathogenic bacteria and fungi, IOP Conf. Series: Journal of Physics: Conf. Series 1032 (1) 1-8.
4. Bagdassarian V. L., K. S, Bagdassarian and M.S Atanassova 2013 Phenolic profile, antioxidant and antimicrobial activities from the Apiaceae family (dry seeds). Mintage J. Pharm. Med. Sci., 2(4): 26 31
5. Choochote W., B. Tuetun, D. Kanjanapothi, E. Rattanachanpichai, U. Chaithong, P. Chaiwong and B. Pitawat, 2004. Potential of crude seed extract of celery, Apium graveolens L., against the mosquito Aedes...
aegypti (L.)(Diptera: Culicidae). J Vector Ecol, 29(2), 340-346.
6. Delamare A P, I T. Moschen-Pistorello, L. Artico L. Atti-Serafini and S. Echeverriagaray, 2007. Antibacterial activity of the essential oils of Salvia officinalis L. and Salvia triloba L. cultivated in South Brazil, Food chemistry, 100(2), 603-608
7. Depeter E. J. and J. P. Cant 1992. Nutritional factors influencning the nitrogen composition of bovine milk : A Review 1, Journal Of Diary Science, 75(8),2043 – 2070
8. Dlma C. and S. DIma 2015. Essential oils in foods: extraction, stabilization, and toxicity. Current Opinion in Food Science, v.5, p.29-35.
9. El-Din H. M. F. E I.Ghita S. M. A, Badran A. S. Gad and M. M. El-SAid 2005. Manufacture of low fat UF-soft cheese supplemented
10. F.D.A. (Food and Drug Administration)2016 Substances generally recognized as safe. Electronic code of federal regulations 21 cfr 182. U.S. government publishing office.
11. Frankel E N 1996 Antioxidants in lipid foods and their impact on food quality. Food Chemistry 57: 51-55
12. Haifa, A. A. A. M, Alsirrag, H. A, Zaiab, M. M, Rabiaa, and A. Salih 2018. Improving the quality of beef burger by adding Thyme and Rosemary powder. Journal of global pharma Technology. Vol: 10 (No,:11-12).
13. Hassanien, M F R. 2014. Soft cheese supplemented with black cumin oil: impact on foodborne pathogens and quality during storage. Saudi Journal of Biological Sciences, 21, 280-288.
14. Han X. T. Shen and Lou, H. 2007. Dietary polyphenols and their biological significance. International Journal of Molecular Science 8: 950-988. 2211
15. Hassanian M. F. R., A. M. Samir and M. Khalid 2014 Soft cheese supplemented with black cumin oil: Impact on food borne pathogens and quality during storage. Saudi Journal of Biological Sciences, 21: 280–288
16. Hosny I. M, W. I, ElKholy H. A. Murad and R K Dairoyut 2011 Antimicrobial activity of curcumin upon pathogenic microorganisms during manufacture and storage of novel style cheese 'Karishcum". Journal of American Science,7:611-618
17. Jarvis B 1983 Mould and mycotoxins in mouldy cheese. Microbiology Aliments Nutrition 1:187 – 191
18. Kooti W, M. Ghasemiboroono M. Asadi-Samani M. Ahangarpoo M. Zamani and A. Amirzargar 2014. The effect of halcoholic extract of celery leaves on the delivery rate (Fertilization and Stillbirths), the number, weight and sex ratio of rat off spring. Adv Environ Biol. 8(10):824-30
19. LIBRÂN, C. M. 2013. Potential application of aromatic plant extracts to prevent cheese blowing. World Journal of Microbiology and Biotechnology, 29, 1179-1188
20. MORO, A 2015 Dairy matrix effect on the transference of rosemary essential oil compounds during cheese making. Journal of the Science of Food and Agriculture, v.95, p.1507-1513
21. Moosavy, M. H, S. Esmaeili, and E. Mostafavi 2013. Antibacterial effect of Mentha spicata essential oil on Listeria monocytogenes in traditional lighvan cheese, Journal of Food Safety, 33(4), 509-514
22. Naglaa, H. M, Hassanen2 A. M. F. Eissa1 Sa'eb A. M. Hafez and A. M. Esraa 2015 Antibioxidant and antimicrobial activity of celery (Apium graveolens) and coriander (Coriandrum sativum) herb and seed essential oils, Int.J.Curr.Microbiol.App.Sci (2015) 4(3): 284-296
23. Naigre P, P, Kalck C, Roques I Roux and G Michel 1996 Comparison of antimicrobial properties of monoterpenes and their carbonylated products, Planta medica, 62(03), 275-277
24. Olmedo, R. H.; V. Nepote, and N.R. Grosso, 2013 Preservation of sensory and chemical properties in flavoured cheese prepared with cream cheese base using oregano and rosemary essential oils, LWT-Food Science and Technology, 53(2), , 409-417.
25. Olle M and I Bender 2010 The content of oils in umbelliferous crops and its formation Agron. Res., 8(Special Issue III): 687 696.
26. Olmedo R. H, V. Nepote and N. R. Grosso 2013 Preservation of sensory and chemical properties in flavoured cheese prepared with cream cheese base using oregano and rosemary essential oils, LWT-
Food Science and Technology, 53(2), 2013, 409-417
27. Samir A. M, F. R. Mohamed and M. E. Khalid 2013. Cold pressed Nigella Sativa Oil inhibition the growth of foodborne pathogens and improve quality of Domiati Cheese Journal of food Safety, 33: 470- 480
28. Riyadh S. A, A. Manal F. H. Alssiraj ,Laith. Al-Obaidi. 2018 Diagnosis of volatile components of local Iraqi honeys by GC-Mass spectrophotometry and study its effect against some pathogenic bacteria, J. Pharm. Sci. & Res. 10(12), 3111-3117
29. SAS 1989. SAS/STAT users Guide. Statistics Ed. N.C.
30. Scott R. 1981. Cheese making Practice. Applied Sci. Publisher Ltd. London.
31. Suganya S, R., Bharathidasan G. Senthilkumar, P. Madhanraj and A. Panneerselvam 2012 Antibacterial activity of essential oil extracted from Coriandrum sativam Pharm. Res., 4(3): 1846 1850
32. Obeid .S.H. and M. B. jaber. 2019. Chemical composition and antioxidant Activity of pelargonium graveolens oil. Iraqi Jour of Agricultural Sci , 49(5):811-816
33. Sura, S. Kafaji. 2014. Effect of dietary supplementation of crushed seed of (Apium graveolens) on some physiological parameters in broiler breeder (Hubbard flex)... journal of kerbala university, 12 (1): 1-9.
34. Awad. A.H., J. H. Awda, M. A. Alssirag, and D. Allaalfalahi. 2019. GC-MASS Analysis of (apium graveolns) leaf extracts obtained with aqueous and methanol extraction and study its antimicrobia activity, Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 21, No. (1) :: 84-90