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EFFECT OF MENTHE LONGIFOLIA AND ANISE ESSENCES ON PHYSICOCHEMICAL PROPERTIES OF SWEET CORN COATED WITH CHITOSAN

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ABSTRACT

To study the effect of some natural compounds on storage life of sweet corn (Saccharata), cultivar zea mays, edible chitosan coating and essences of were used. Essences at two concentrations of 0.5 and 1 mgl and chitosan as unmixed and combined with essences in 0.5 and 1% ratio were used. According to these design 20 samples was prepared. Firmness, spoilage and acidity were measured within 30 days. The results showed that combined treatments could maintain the firmness of corns as compared to unmixed treatment and increased soluble solid matters was observed in combined treatments at any stage of storage as compared to control sample. 0.5% chitosan treatment showed better control over fruit weight loss due to water holding resulting in increased firmness and decreased soluble solids when compared to control.

Keywords: Chitosn, Corn, Storage life

1. INTRODUCTION

Preservatives are natural or synthetic chemicals added to foods to protect them from spoilage caused by microbial growth and / or chemical variations. Preservatives are used individually or in combination with other long – term storage methods [6]. Benefits and health of these synthetic substances for long – term storage are still controversial [3]. There are various natural preservatives containing phenolics with

antioxidant properties which can be used as natural antioxidants or in place of synthetic antioxidants [7]. These include essential plant extracts and phenolics [9]. Essences of olive leaves, asparagus, shallot, thyme, wild mint and anise are extracts exerting antimicrobial and antifungal effects used in foods as antioxidant because of having active compounds such as alphapinen, 1, 8-cineol, carvacrol, anthol, etc [1]. This study aimed at investigating the effect of menthe longifolia, zataria multiflora, and anise essences at concentrations of 0.5 and 1% on physicochemical properties of sweet corn coated with chitosan (0.3 and 0.5%).

2. MATERIALS & METHODS

2.1. Materials

All essences were provided by Barij Essence Co. All chemicals were purchase from Merck (Darmstadt, Germany).

2.2. Methods

2.2.1. Preparation of chitosan and herbal essences – based edible coating

Chitosan edible film was prepared by solving intermediate molecular weight chitosan (sigma co.) in 1% (v/v) acetic acid at concentration of 2% (w/v) on magnetic plate. The solution was filtered and then transferred to the magnetic plate to which – 0.50 mLg^{-1} Tween 80 as lubricant was added individually and combined with chitosan at 0.5 and 1% were added to chitosan film (Table 1) to form a mass of essences on the film.

Table1: Formulation of treatment

Samples	Chitosan(g/l)	Menthelongifolia(g/l)	Zatariamultifora(g/l)	anise(g/l)
K1	0	0	0	0
K2	0.3	0	0	0
K3	0.5	0	0	0
KO1	0.3	0	0.5	0
KO2	0.5	0	0.5	0
KO3	0.3	0	1	0
KO4	0.5	0	1	0
KF1	0.3	0	0	0.5
KF2	0.5	0	0	0.5
KF3	0.3	0	0	1
KF4	0.5	0	0	1
KT1	0.3	0.5	0	0
KT2	0.5	0.5	0	0
KT3	0.3	1	0	0
KT4	0.5	1	0	0
KOT1	0.3	0.5	0.5	0.5
KOT2	0.5	0.5	0.5	0.5
KOT3	0.3	1	1	1
KOT4	0.5	1	1	1
Control	-	-	-	-

2.2.2. Preparation of corn samples

Corns were washed and then classified into 19 groups. They submerged in the coatings solutions for 1 min, dried at 25C and then stored. The packaged samples were evaluated at 0, 7, 15 and 30 d in triplicate [4].

2.3. Tests

Acidity, dry and wet weight and soluble solids were measured according to National Standard. Firmness of samples was determined by punch method by use of texturometer (OPERON Co. FDO-8606, Korea). A cylindrical probe with 25mm d speed of 1.0 mm S and penetration depth of 15mm was used.

3. RESULTS & DISCUSSION

3.1. Dry and wet weight

The results from wet and dry weight measurement are given in Curve 1and 2. According to the results corn treatments showed significant differences in dry and wet weight (p<0.05). Dry and wet weight of coated samples showed less weight loss. Temperature also had a significant effect on weight loss. As the extracts concentration increased, wet weight of samples significantly increased.

For dry weight, extended storage time resulted in significant decrease in dry weight likely due to moisture exchange with the surroundings and moisture loss during storage. Increased chitosan concentration in the packaging resulted in decrease in dry weight of samples, however, increased percentage of essence had no significant effect on dry weight (p<0.05).

Increased essence concentration resulted in a significant increase in wet weight. Single – essence containing samples showed wet weight lower than combined treatments. 0.5% chitosan – containing samples wet weight of was higher than dry weight. Polysaccharide structure of chitosan seems to prevent moisture loss during storage.

3.2. pH

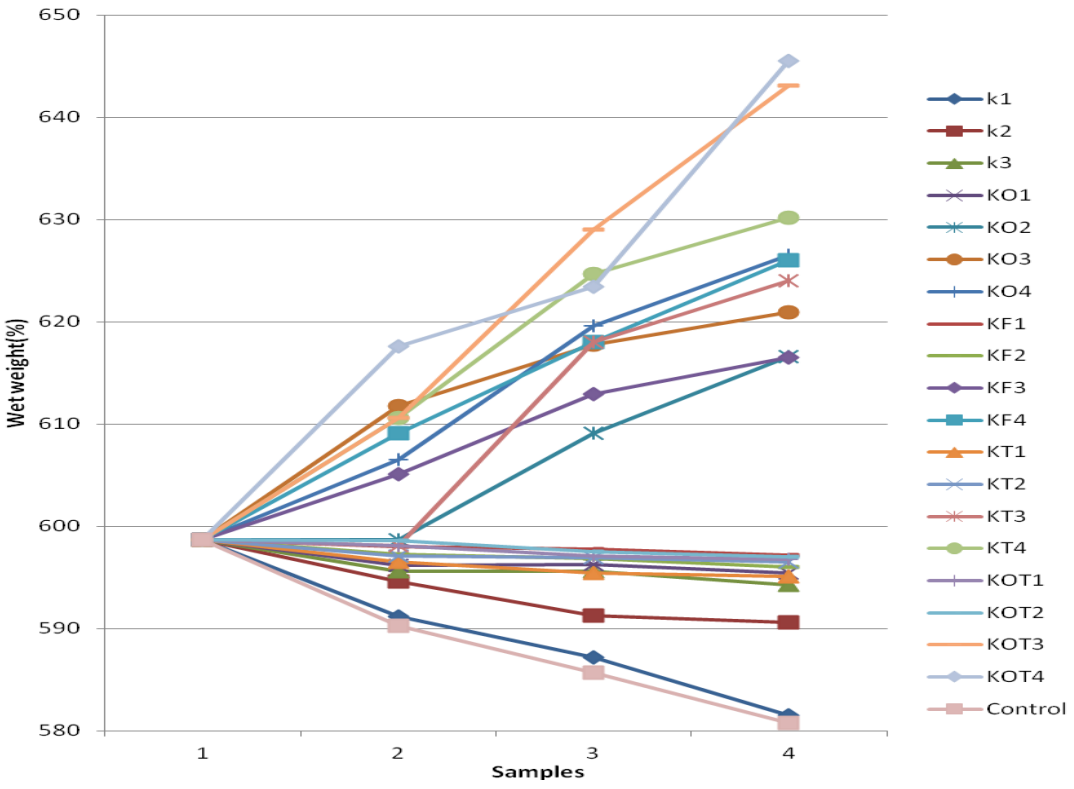
The results from pH measurement are given in Curve 3. The results showed that pH in all samples significantly decreased as chitosan and essence concentrations increased (p<0.05). The effect of storage period was also significant, i.e. as the storage period and essences concentration increased pH in all samples showed a significant decrease (p<0.05).

Addition of essences resulted in decrease in pH of corn samples. Samples containing 0.5% chitosan had higher acidity than 0.3% chitosan – containing samples. Chitosan is soluble in 2% acetic acid, thus addition of higher concentrations of essences leads to use of higher acetic acid concentration of in the formulation of coating solution. Essences decrease the pH variations because of having acid components.

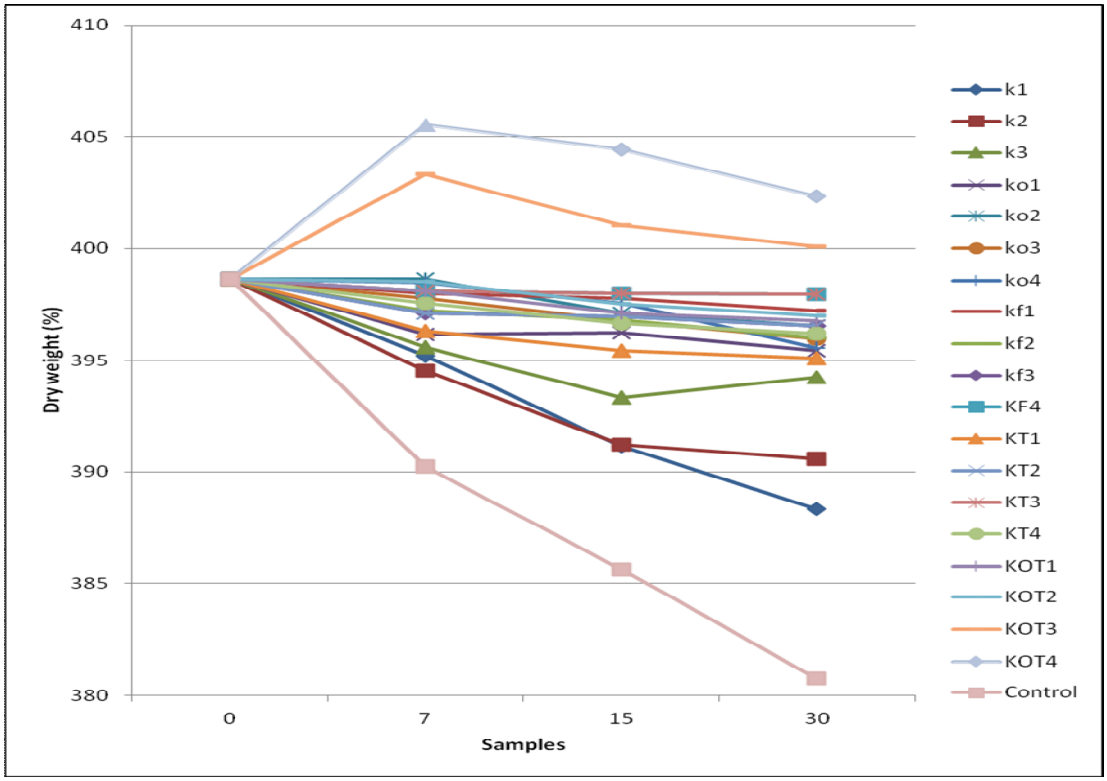
Abdoli (2014) Studied the effect of aqueous extract and essence of thyme leaves on physicochemical, and sensory properties as well as stability of yogurt and reported that addition of extract and essence of thyme did not affect pH value however there was significant samples at 1% level [1].

3.3. Soluble solid matters

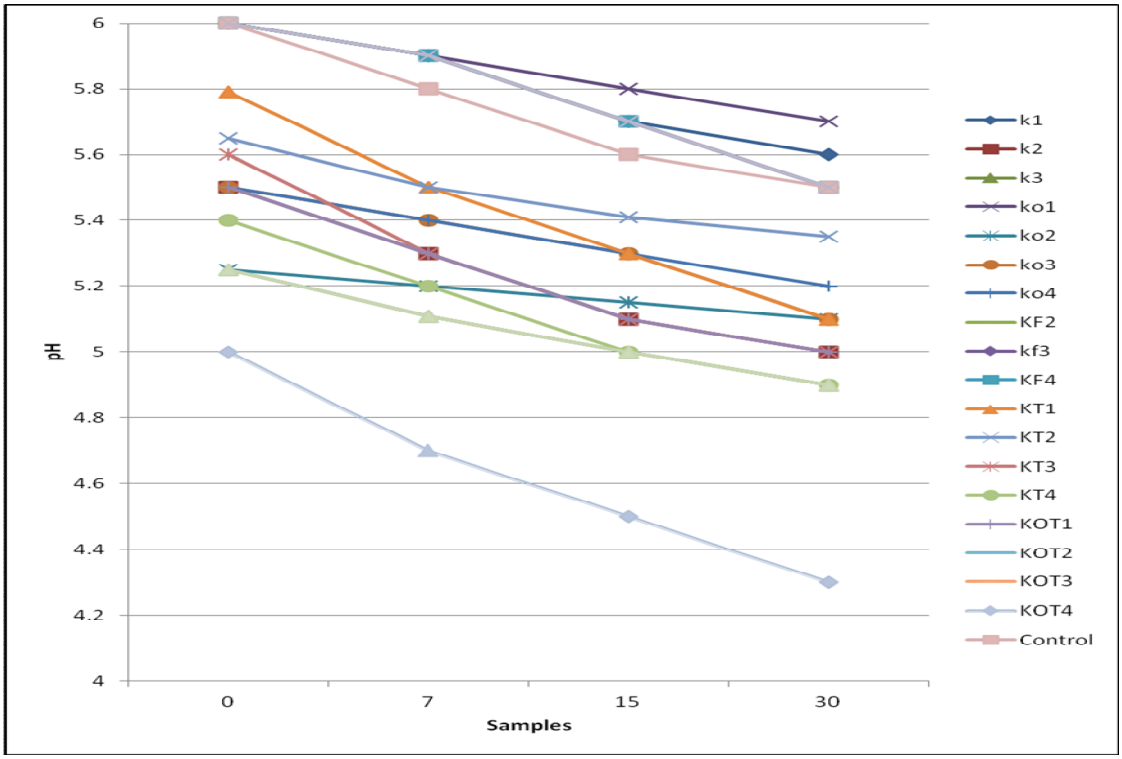
According to Curve4, addition of essence and chitosan increased and solid matters content respectively. Increased chitosan concentration resulted in more pronounced decrease in solid matters in samples during storage. There was significant difference in solids among the treatments (p<0.05). Also a significant decrease occurred in solid matters in the control sample. In combined samples also solids content significantly increased (p<0.05) as the concentration of essences increased. In K_1, soluble solid variations showed a constant trend and there was no significant difference (p<0.05). Also there was no significant difference there was no significant difference among the samples containing equal amounts of chitosan and essences (p<0.05).



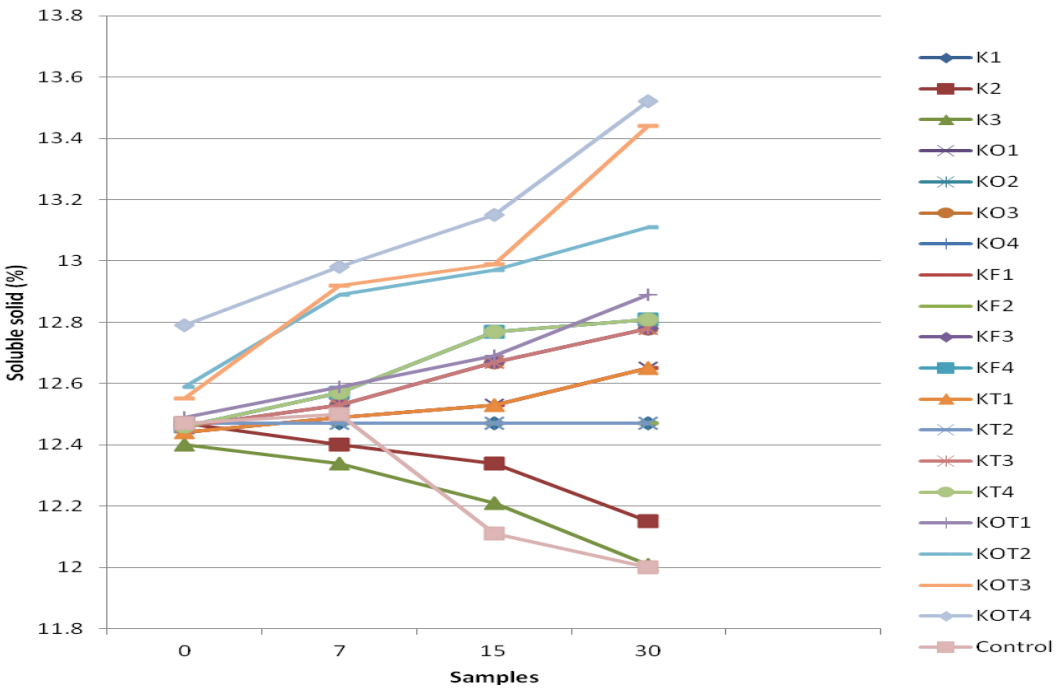
Curve1: Wet weight of samples during 30 days of storage



Curve2: Dry weight of samples during 30 days of storage



Curve3: pH of samples during 30 days of storage

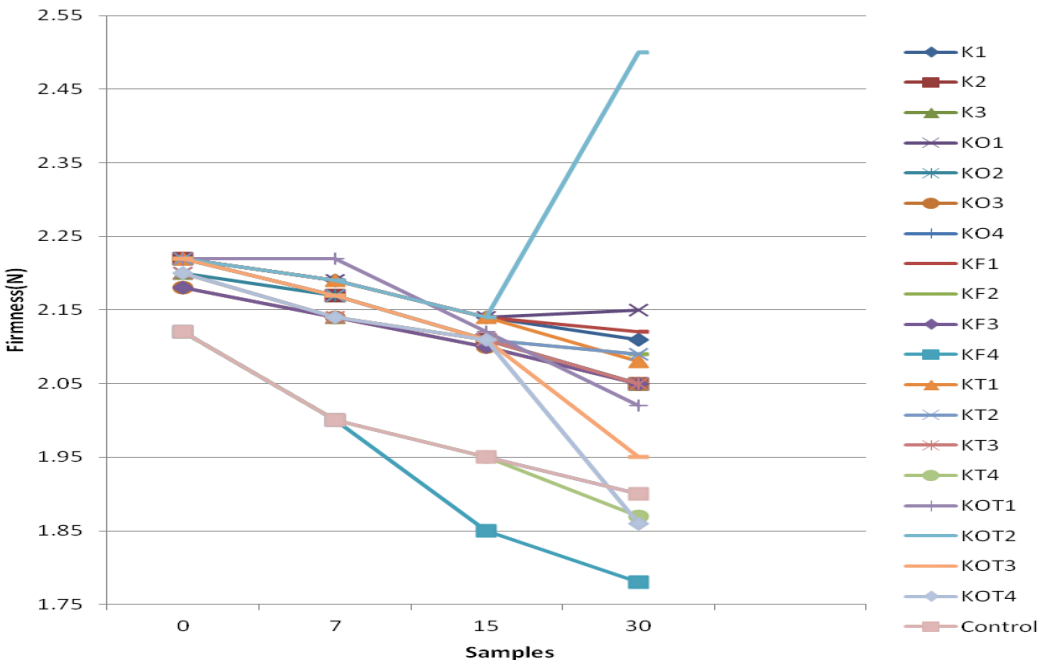


Curve 4: Soluble solid of samples during 30 days of storage

The results of means comparison revealed that addition of essences increased the solid contents. It seems that addition of high percentages of different essences increased the variation in corn's texture. Increased acidity as a result of addition of essences also increased soluble solids content which is in agreement with the results obtained by Alikhani *et al.*, (2009) [2]. Incorporation of high concentrations of chitosan coating into the formulation prevented moisture loss as well as soluble solids variations in treated samples. Also in coated samples containing equal concentrations of chitosan and essences, migration of essences from the coating was inhibited by increasing essence concentration and there was no significant difference.

3.4. Firmness

Results from firmness (Curve 5) measurement showed that in control corn sample, firmness significantly increased (p<0.05). Firmness of samples containing 0.3 and 0.5% essence showed no significant difference during storage. Type of essence had no significant effect on the firmness. Samples containing different concentrations of essences showed decreased firmness, i.e. addition of high concentrations of essence results in an increase in softness. Decreased firmness during storage is due to decomposition of insoluble prospecting thereby turning it into pectinic acid and soluble pectin. Increased activity of pectin esterase and polygalactoronase results in decrease in chain length in pectinic matters and softness of corn texture [5].



Curve 5: Firmness of samples during 30 days of storage

Also decrease in water content during storage decreased cellular turgescence pressure and texture firmness. Firmness of corn texture showed a nonlinear and some logarithmic decrease. Initially, variations showed a sharp gradient and then slowed. Firmness variations showed similar trend for samples coated individually or combined with chitosan (K_2 and K_3) and uncoated essence – free samples. There was no significant difference during storage i.e. chitosan coating had no significant effect on the firmness of samples during storage (p<0.05). The results are consistent with the findings obtained by Sahraiyan (2012) [8]. They investigated the chitosan nanoemulsion coatings on gala apple during storage and found that chitosan coating alone had no effects on the firmness of gala apples.

4. CONCLUSION

The results showed that packaging with low concentrations of essences had no significant effect on the storage period of corn. Extension of storage time and improvement of corn characteristics were more pronounced for samples containing higher essence concentration. Also high concentration of chitosan increased the storage period. Higher concentrations of thyme and high concentration of chitosan increased the storage time of corn samples followed by essences.

5. REFERENCES

[1] Abdoli, J. 2014. The effect of aqueous extract and essential oils of thyme leaves on physicochemical properties, sensory and stability of our master's thesis, Agricultural

Engineering - Food Science and Technology, Islamic Azad University of Sabzevar.

[2] Alikhani, M., Sharifani, M., Azizi, M., Hemati,. K. H., Mosavizade, S .2009. The effect of natural compounds on storage life and quality characteristics Whiskey. *CFANS.*, 3: 615-627.

[3] Carson, C. F, Mee, B. J. & Rilley, T. V. 2002. Mechanism of action of melaleuca alternifiolio (tea tree)oil on staphylococcus aueus determined by time-kill,lysis,leakage and salt tolerance assays and electron microscopy . *AAC.*, 46,6: 1914-20.

[4] Chien,P.J., Sheu ,F. & lin, H. R. 2007. Quality assessment of low molecular weight chitosan coating on sliced red pitayas. Journal of food engineering., 79(2): 736-740.

[5] Mizani, M., Ebrahimi, M. N. ,Gerami, A. & Tavakoli, F. A. 2009. Effect of gamma irradiation on physico-mechanical properties of spice packaging film., Radiation Physics and Chemistry., 78, 9 : 806–809.

[6] Oussalah, M., Caillet, S., Saucier, L. & Lacotrix. M. 2007. Inhibitory effect of selected plant essential oils on the growth of four pathogenic bacteria: E. coliO157: H7, Salmonella typhimurium, Staphylococcus aureus and Listeria monocytogenes. *Food Control.*, 18, 412 – 421.

[7] Rasooli, I. & Rezaei, M. B. 2001. Antimicrobial effects of ampicilin and essential oil of Zataria multiflora. *Hakim.*,4, 219-225.

[8] Sahraiyan, B., Naghi pour, F. & Tabatabai yazdi, F. 2012. Comparison of the effect of methanol extract of mint, rosemary and Stkhvdvs on the growth of Escherichia coli and Bacillus cereus. *CFANS.*, 4, 5-1.

[9] Seydim, A. C. & Sarikus, G. 2006. Antimicrobial activity of whey protein based edible films incorporated with thyme, rosemary and garlic essential oils. *Food Research International*, 39, 639-644.