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EFFECT OF CRESS SEED GUM (*LEPIDIUM SATIVUM*) ON SOME PHYSICOCHEMICAL PROPERTIES OF RICE COOKIE DURING STORAGE

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ABSTRACT

Brass candy is one of the traditional candies in Iran because of the gluten free for coeliac disease. Some problems are the high sweetness, breaking and crushing problems in handling, storage and marketing of its product. The aim of this study was to improve the physicochemical characteristics of rice cookie with cress seed gum. In this study, the gum of cress seed was extracted and the ratio of 0.5, 0.75, 1, 1.25, and 1.5 percent was used in the formulation of cooking. The results showed that the addition of cress seed gum decrease in pH levels ($p<0.05$). The moisture content of the samples was increased by adding a gum because of its ability to absorb and hold water. Amount of ash component increased with the addition of gum in compared to control treatments ($p<0.05$). The stiffness of the samples increased with concentrations of the cress seed gum. Thus adding to the cress seed gum 1% is recommended as an acceptable level of cooking products.

Keywords: Rice cookie, cress seed gum, physicochemical properties

INTRODUCTION

Coeliac disease (CD), also known as gluten-sensitive enteropathy (GSE), has been defined as a state of increased immunological responsiveness to ingested wheat gliadin or

similar prolamins from rye, barley and probably oats in genetically susceptible individuals (Akbari *et al*., 2006). The lack of gluten in the diet generally leads to a return of the histological changes to a rather normal state (Trier, 1991). The only way to ameliorate the symptoms is keeping the diet of celiac patients as gluten-free (Neumann and Bruemmer, 1997). Rice flour has many unique attributes such as bland taste, white color, ease of digestion, and hypoallergenic properties. Low levels of protein and sodium, the absence of gliadin, and the presence of easily digested carbohydrates make it an ideal food for patients suffering from celiac disease (Gujral *et al*., 2003). Hydrocolloids are a kind of Polysaccharides with high molecular weight and water-soluble (Ward and Andon, 2002). Hydrocolloids have been available in variety, but as consumer demands have changed throughout the years and understanding of gum functionality within the industry has increased, food processors have adapted them to match food trends. On the other hand, the consumer preference for plant-derived materials has been increased. Among commercial gums, the hydrocolloids from seeds are still used extremely in food formulations because of their appropriate price, easy availability and proper functionality (Naji and Razavi, 2014). Garden cress seed (*Lepidium sativum L.*) is an important medicinal source used in traditional medicine for the treatment of various diseases (Doke and Guha, 2015). The seeds of *L. sativum* contain a large amount of mucilaginous substances, which are a good source of hydrocolloids with high molecular weight of 540 kDa. rice cookie is obtained of soft rice flour, hydrogenated fats, ground cardamom, sugar, eggs and water and it is native to Kermanshah. Thus, we evaluated effect of cress seed gum (*Lepidium sativum*) on some physicochemical properties of rice cookie during storage.

MATERIAL AND METHODS

Evaluation of moisture content, pH and ash were conducted in accordance with the national standard of 2705, 37and 2706, respectively. Stiffness test was performed by AACC standard method. Table 1 showed treatments. The CRD statistical design was applied and Duncan's multiple range test was used to determine the difference between the means at the confidence level of 5%.

Table 1: List of rice cookie treatments with different concentration of cress seed gum

Treatments	Formulation
control	rice cookie without cress seed gum
T1	rice cookie + 0.5% of cress seed gum
T2	rice cookie +0.75% of cress seed gum
T3	rice cookie +1% of cress seed gum
T4	rice cookie +1.25% of cress seed gum
T5	rice cookie +1.5% of cress seed gum

RESULT AND DISCUSSION

Moisture

According to the results of Figure 1, the moisture content of rice cookie increased in the all samples with increasing the concentrations of cress seed gum but these increases statistically was not significant. The results showed that the moisture content of all samples was reduced during storage. In the third week, T3 treatment had highest moisture until end of experiment and between treatments, T3 treatment was best result for moisture. Mohammad Amini *et al.*, (2007) mentioned that Balangu seed gum increased bread moisture.

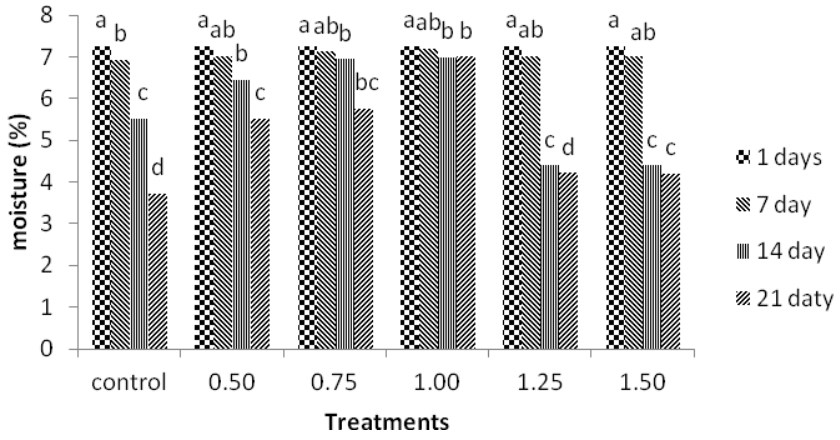

Figure 1: effect of different concentration of cress seed gum (0.5, 0.75, 1, 1.25, and 1.5%) on moisture content of rice cookie during storage

Table 2: analysis of variance (ANOVA) rice cookie for moisture

Source of variation	Degree of freedom	Mean of square	F	P (probability)
Treatment	5	226.82	2.95	<0.05
Time	3	238.35	3.10	<0.05
Treatment*time	15	102.26	1.33	<0.001
Error	48	76.89		

According to ANOVA in Table 2, the *p* value of treatments and time and interaction effect of treatment*time were less than 0.05, this means that all of aforementioned factors had significant effect on moisture variation. Since the Factor F for Times' was higher than treatments, and interaction effect of Treatment*time, so, storage time had more

significant effect on moisture variation in compare to concentrations of the cress seed gum in treatments.

pH

The results of Figure 2, showed that samples that have higher cress gum gum showed lower pH. This result was coordinate with research of Umesha *et al.*, (2015) that cress gum led to decreasing of pH. Figure 2, showed that pH decreased after 3 weeks in all treatments.

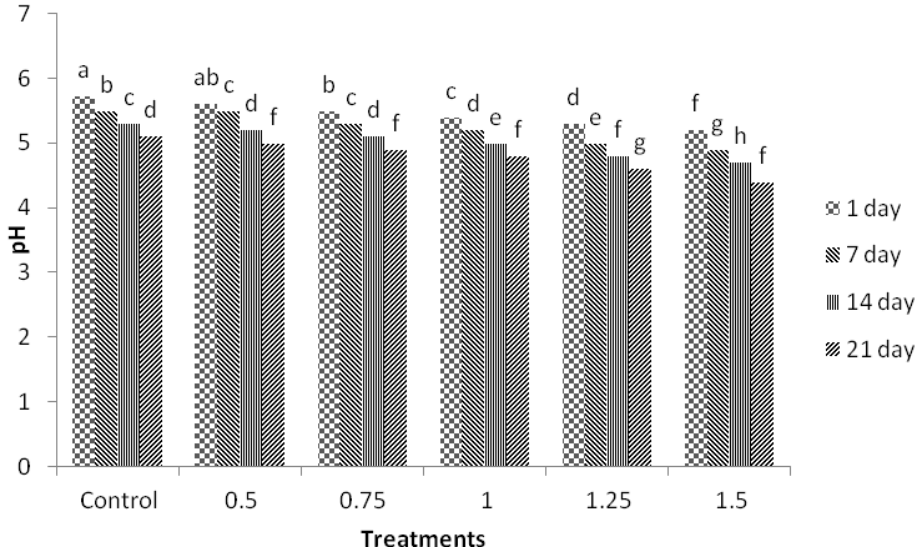

Figure 2: effect of different concentration of cress seed gum (0.5, 0.75, 1, 1.25, and 1.5%) on PH of rice cookie during storage

Source of variation	Degree of freedom	Mean of square	F	P (probability)
Treatment	**5**	**0.00315**	**13.73**	**<0.05**
Time	**3**	**0.01712**	**74.47**	**<0.05**
Treatment*time	**15**	**0.00193**	**8.43**	**<0.001**
Error	**48**	**0.00023**		

According to ANOVA in Table 3, the *p* value of treatments and time and interaction effect of treatment*time were less than 0.05, this means that all of aforementioned factors had significant effect on pH. Since the Factor F for Times' was higher than treatments with different concentrations of the cress seed gum, and interaction effect of Treatment*time, so, storage time had most significant effect on pH.

3.3. Ash

According to the results of Figure 3 all treatments had significant differences with control on ash content. The highest ash was

obtained in sample contain 1.5% cress seed gum. In disagreement with the results of current study Turabi *et al*., (2010) reported that gum didn't increase ash% of bread product.

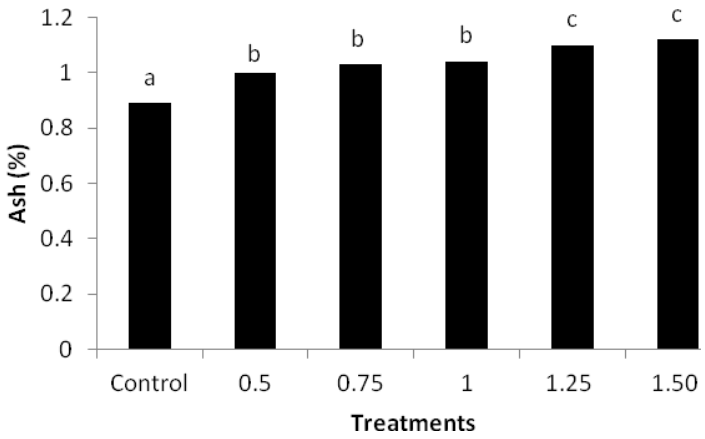

Figure 3: effect of different concentration of cress seed gum (0.5, 0.75, 1, 1.25, and 1.5%) on Ash content of rice cookie during during storage

Table 4: analysis of variance (ANOVA) rice cookie for Ash

Source of variation	Degree of freedom	Mean of square	F	P (probability)
Treatment	**5**	**0.965**	**2.83**	**<0.05**
Time	**3**	**1.176**	**3.45**	**<0.05**
Treatment*time	**15**	**1.807**	**5.3**	**<0.001**
Error	**48**	**0.341**		

Table 4, showed that the *p* value of treatments and time and interaction effect of treatment*time were less than 0.05, this means that all of aforementioned factors had significant effect on Ash. Since the Factor F for Times' was higher than treatments with different concentrations of the cress seed gum, and interaction effect of Treatment*time, so, the storage time had most significant effect on variation of ash content in treatments.

3.4. Stiffness

Figure 4, showed the stiffness of rice cookies samples during storage. Adding various concentrations of the cress seed gum compared to control had significant changes in the stiffness.

Stiffness decreased with the addition of the cress seed gum at 0.5% and 0.75% compared to control sample but application of 1% cress seed gum led to increasing of stiffness.

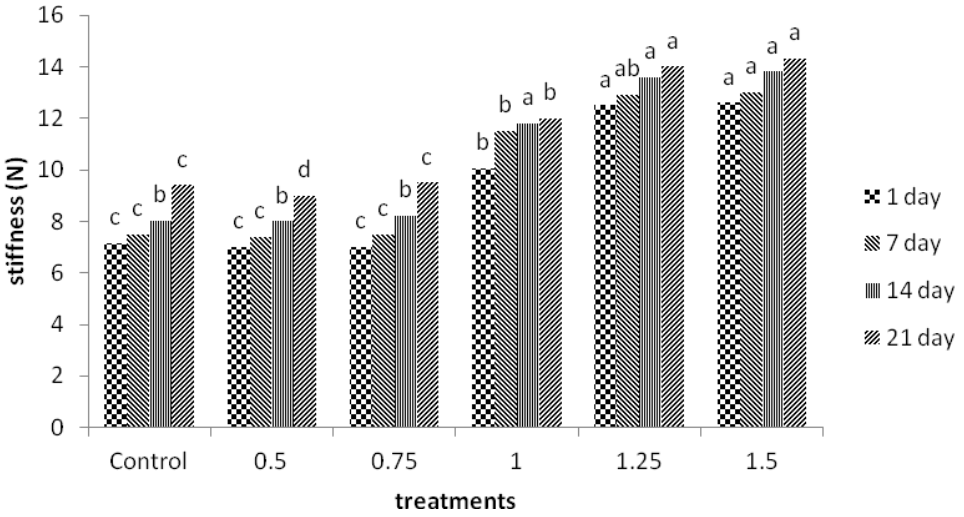

Figure 4: effect of different concentration of cress seed gum (0.5, 0.75, 1, 1.25, and 1.5%) on stiffness of rice cookie during storage

Source of variation	Degree of freedom	Mean of square	F	P (probability)
Treatment	**5**	**400.29**	**3.30**	**<0.05**
Time	**3**	**418.4**	**3.45**	**<0.05**
Treatment*time	**15**	**1024.9**	**8.45**	**<0.001**
Error	**48**	**121.3**		

Table 5, showed that the *p* value of treatments and time and interaction effect of treatment*time were less than 0.05, this means that all of aforementioned factors had significant effect on stiffness of rice cookies. Factor F for interaction effect of Treatment*time, was highest therefore it has the most significant effect on variation of stiffness of treatments and after that storage time had more significant effect on stiffness than treatments formulations.

CONCLUSION

Generally, the results showed that the addition of cress seed gum decreased level of pH. The moisture content of the samples was increased by adding cress seed gum because of its ability to absorb and hold water. Amount of ash component increased with the addition of gum in compared to control treatments. The stiffness of the samples increased with concentrations of the cress seed gum. Thus adding to the cress seed gum 1% is recommended as an acceptable level of cooking products. According to results, it was founded that cress seed gum had positive effect on physicochemical properties of rice cookie during storage. Humidity of samples was increased by application of cress seed gum and samples contain 1% cress seed gum had highest humidity. Tissue of rice cookies were improved by application of cress seed gum in stress and add concentrations of 1

percent cress seed gum resulted in stiff samples. According to the results of this study, using of cress seed gum suggest as a hydrocolloid to improve physicochemical properties such as fragmentation and fragility of rice cookie products.

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