SciDoc Publishers
Infer, Interpret & Inspire Science

OPEN ACCESS

International Journal of Food Science, Nutrition and Dietetics (IJFS)
ISSN 2326-3350

Effect of Oregano Herb on Dough Rheology and Bread Quality

Review Article

Dhillon G K [1*], Ahluwalia P[1*], Kaur A [1]

1* Department of Food Science and Technology, Punjab Agricultural University, Punjab, India

Abstract

The effect of addition of oregano at 1, 2, 3 and 4 % in formulation was examined in order to obtain herbal, antioxidant-enriched bread with good baking, textural, nutritional and sensorial properties. Oregano was found to be rich in crude fibre (17.43%), total phenol content (87.80 GAE/100g DW) and antioxidant activity (84.80%) which strengthens its use as a functional food. Farinograms obtained after addition of oregano suggested that oregano increased water absorption and dough development time. A significant decrease in dough stability was also observed. Therefore, little modifications were done in baking procedure to prepare oregano bread. Increasing levels of oregano increased the baking bsorption and specific volume of the bread. From sensory point of view 2% level of oregano in the bread was selected as best. Oregano bread was high in total phenolics content (TPC) and radical scavenging activity (RSA). Result suggested that oregano up to 2% level in bread can be added without any major change in baking and sensory properties along with better shelf life.

Keywords: Oregano; Total phenol content; Antioxidant activity; Farinograms; Baking; Sensory properties.

***Corresponding Author**:
Gurpreet K Dhillon & Preeti Ahluwalia
Department of Food Science and Technology, Punjab Agricultural University, Punjab, India
Tel: 91-0161-2401960 Ext-305
E-mail: gurpreet1183@gmail.com

Received: May 08, 2013
Accepted: May 20, 2013
Published: May 23, 2013

Citation: Dhillon G K & Ahluwalia P(2013) Effect of Oregano Herb on Dough Rheology and Bread Quality. Int J Food Sci Nutr Diet. 2(4), 40-44. **doi:** http://dx.doi.org/10.19070/2326-3350-130008

Copyright: Dhillon G K & Ahluwalia P © 2013 This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Introduction

In the last decades consumer demands in the field of food production has changed considerably. Consumers believe that foods contribute directly to their health (Chen, 2011; Mendis and Kim, 2011; Siro et al., 2008). The practice of using nutritional knowledge in food product to improve the health of consumer forms the general concept of functional foods (Peressini & Sensidoni, 2009). In this respect, phytochemicals have received increased attention because of their biological significance and potential positive health effects (Hayta and Gamze, 2011). Herbs have been considered as the most usable resources for the development of nutraceutics - functional foods (Arsic, 2003). Oregano is known for its high antioxidant activity (Amarowicz et al., 2009; Kim et al., 2012). Antifungal activities of oregano is attributed carvacrol (Burt, 2004; Kocić-Tanackov et al., 2012). Moreover, it has additional advantages as flavor enhancer, apart from being beneficial to health; it adds variety to the food.

Baked foods are suitable for functional food development because of their nutritive value and their value as carriers of bioactive component. Bread is the major bakery product and consumed worldwide in relatively large amounts. Functional breads formulated with bioactive compounds are becoming important in the bakery industry, and various ingredients are being used to improve the health benefits of the final product.

This study was aimed to evaluate the effects of different amounts of oregano and thyme on the quality characteristics herbal breads. Moreover the possibility to obtain an antioxidant-enriched final product with good shelf life was studied.

Material And Methods

Materials

The dried oregano was purchased from a local market, dried, grounded, packed in sterilized plastic bags and treated in microwave for 915 MHz for 1 min. Wheat flour, yeast, salt, sugar etc purchased from local market for bread making.

Physicochemical properties of raw materials

Prescribed protocols of AACC (2000) procedures for moisture, ash, protein and fibre were thoroughly followed.

Determination of anti-oxidant capacity of cinnamon

The antioxidant activities of cinnamon powder was evaluated through free radical scavenging effect on 1,1-diphenyl-2-picryl-hydrazyl (DPPH) radical. The determination was based on the method proposed by Akowuah et al. (2005). Percentage of DPPH scavenging activity was calculated as % inhibition of

DPPH =[Abs control –Abs sample / Abs control] x 100

Determination of total phenol content

Total phenolic contents of all plants extracts were determined using Folin-Ciocalteu reagent as described by Singlaton & Rossi (1965). Samples were inserted into different test tube and mixed thoroughly with 5 ml Folin-Ciocalteu reagent (previously pre-dilute 10 times with distilled water). After 5 mins, 4 ml of 7.5% sodium carbonate was added and allowed to react for 2 hrs at room temperature. The absorbance was measured at 765 nm using spectrophotometers. Samples were measured in three replicates. Standard curve of gallic acid solution (10, 20, 40, 60, 80 and 100 ppm) was prepared using the similar procedure. The results were expressed as mg GAE/100 g extract sample.

Bread

Straight dough AACC method (Anonymous, 1990) numbered 10 – 10 B was followed. The formula for control was as: flour-100 g, Compressed yeast-3.0 g, Sugar-2.5 g, Bakery shortening-2.0 g, Salt / NaCl-1.0 g, Potassium bromated 1 ppm, Water Optimum. The dough was prepared and baking schedule is given as:Fermentation-45 min, Remixing-25 sec, Recovery-20 min, Sheeting and moulding-3 min, Proofing (at 86 ° F, RH 75%)- 55 min, Baking-25 min at 450 ° F.

Bread quality

The loaves were analyzed for specific volume (cc/g) and loaf height (cm).

Sensory quality

Sensory evaluation for appearance, color, texture, flavor and overall acceptability was carried out the next day by a panel of minimum ten semi trained judges on nine point hedonic scale (Larmond, 1970).

Texture analysis

Hardness was measured as an index of bread texture by Stable Micro System Texture Analyser Model (TA-H di England) using settings as Test-TPA, Probe-75 mm Cylindrical, Pre-test speed-1 mm/s, Test speed-1 mm/s, Post-test speed-1 mm, Force- 250kg.

storage studies

Bread samples were packed in low density polyethylene bags and analyzed for visual mold growth for a week at room temperature (30 ± 50^0C)

Statistical Analysis of data

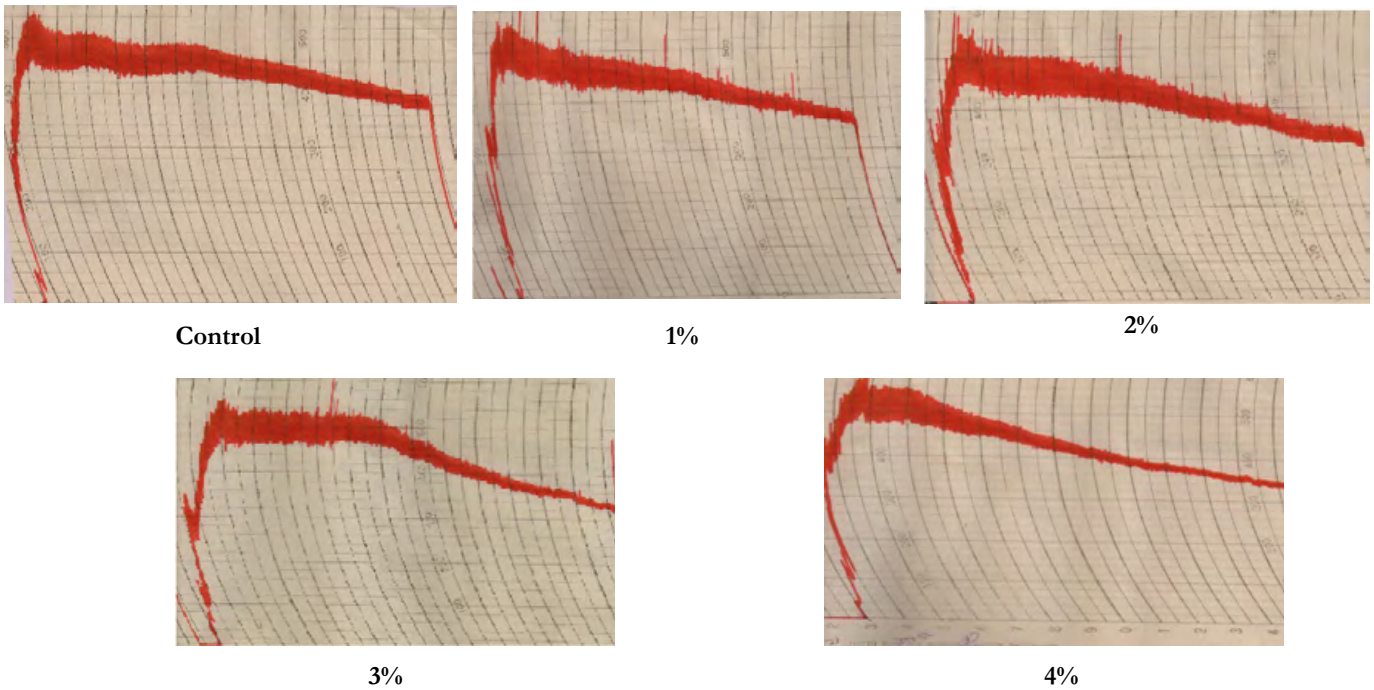
The data collected on different characteristics were analysed with the help the software CPCS-1(Singh et al., 1991). All results were expressed at 14% moisture basis unless otherwise stated. Each value was mean of three observations.

Result And Discussion

Dried oregano was blended at 1-4% level in flour and studied for farinographic characteristics (Table 1). Addition of oregano increased water absorption as compared to control. Oregano at 4% level had maximum water absorption (55%). Dough development time also increased from 2 minutes at 1% to 4 minutes at 4% level of incorporation of oregano in the flour. There was a decrease in dough stability up to 3 % level of incorporation of oregano in the blend. Oregano significantly decreased the mixing tolerance index from 70 to 45 BU as levels of incorporation increased from 1 to 4 %. This showed that there was weakening of dough with addition of oregano in the bread. So the baking process had to be modified accordingly.

Effect of incorporation of oregano on baking quality of bread.

Figure1: Farinograms obtained after addition of dried oregano at different levels



Control **1%** **2%**

3% **4%**

Table 1: Chemical composition, total phenol and antioxidant activity of raw material

Samples	Moisture (%)	Protein (%)	Fibre (%)	TPC (mg GAE/100g DW)	RSA (DPPH % inhibition)
Wheat flour	12.03±0.56	9.17±1.09	0.49±0.08	3.78±0.21	17±2.13
Dried Oregano	8.23±0.67	9.06±0.78	17.43±1.67	87.80±3.21	84.80±4.67

Table 2: Effect of incorporation of dried oregano on farinographic characteristics of flour

Samples	Level (%)	Water absorption(%)	Dough development time(min)	Dough stability(min)	Mixing tolerance index(B.U.)
Control	0	53.00±1.56^{a}	1.50±0.15^{a}	4.00±0.56^{c}	80.00±2.45^{d}
	1	53.30±2.15^{a}	2.00±0.09^{a}	2.00±0.20^{a}	70.00±1.89^{c}
	2	53.90±2.45^{b}	2.00±0.19^{a}	2.00±0.17^{a}	80.00±3.60^{d}
Oregano	3	54.30±2.67^{c}	3.00±0.23^{b}	3.00±0.32^{b}	60.00±3.50^{b}
	4	55.00±1.84^{d}	4.00±0.37^{c}	4.00±0.19^{c}	45.00±2.70^{a}

Table 3: Effect of incorporation of oregano on baking quality of bread

Samples	Level (%)	Bake absorption(%)	Loaf height (cm)	Specific volume (cc/g)	Hardness (Kg)	Overall acceptability (score out of 9.0)
Control	0	70.12±1.17^{a}	9.21±0.55^{b}	4.72±0.29^{b}	1.39±0.09	7.90±0.78^{a}
	1	72.24±1.08^{b}	9.20±0.29^{b}	4.82±0.21^{b}	1.38±0.12	8.12±1.16^{b}
Oregano	2	73.89±2.12^{bc}	9.25±1.07^{bc}	4.76±0.15^{b}	1.35±0.14	8.39±0.89^{c}
	3	74.35±1.89^{c}	8.59±0.67^{a}	4.39±0.19^{a}	1.36±0.07	8.01±0.45^{a}
	4	75.00±1.23^{d}	8.3±0.79^{a}	4.22±1.14^{a}	1.32±1.17	7.95±0.65^{a}

The bread-baking data are shown in Table 3. Significant variations were observed in various parameters of bread making when breads were prepared by incorporation of dried oregano at 1, 2, 3 and 4% level in flour. Incorporation of oregano at increasing level showed an increase in baking absorption as compared to control. At 2% level of oregano, water absorption was 72.24 % and it increased to 75 % at 4 % level. Oregano also increased the loaf weight from 145g at 1 % level to 149g at 4 % level of oregano in the bread. Specific volume (4.72 cc/g) was best at 1% level and decreased to 4.22 cc/g at 4% level of oregano in the blend. This showed that increased level of oregano had a detrimental effect on the specific volume of bread.

The increasing water absorption might have been be caused by the strong water-binding ability of fibers present in oregano. The increasing bread weight was caused by high water retention. The decreasing loaf volume was due to the dilution of gluten and also could have resulted from the interaction between gluten and fiber material of spices and herbs (Chen et al.,1988). Oregano contained significant amount of insoluble fibre which dilutes and disrupts gluten network and probably weakens the interaction between gluten and starch (Noort et al., 2010; Ronda et al., 2012).

Further oregano bread was tested for sensorial properties and observed that oregano bread had better acceptability as compared to control. Overall acceptabilityscore varied from 8.38 to 7.95. Results of sensory analysis suggested that the addition of herbs in the bread had a positive response towards consumer acceptability. The bread incorporated with oregano at 2% level had higher acceptability than the control. Ivanovski et al. (2012) reported an increase in acceptability of bread with supplementation with herbs. Incorporation of oregano had a non-significant effect on hardness (N) of bread. The hardness for control bread was 1.39 N. Bread contained 1% oregano had a hardness value of 1.38 N, which further reduced to 1.32 N at 4% level.

Effect of incorporation of oregano on total phenol content and antioxidant activity of bread.

Table 4: Effect of incorporation of oregano on total phenols and antioxidant activity of bread

Samples	Level (%)	Parameters	
		TPC (mg GAE/100g DW)	RSA (DPPH % Inhibition)
Control	0	0.23±0.02	4.67±0.67
	1	1.05±0.23	12.45±0.45
Oregano	2	0.82±0.12	17.81±0.89
	3	0.96±0.17	21.23±1.12
	4	1.67±0.13	23.14±1.89

Oregano bread (2%) had a TPC of 87.80±1.32 mg GAE/100g DW and RSA 84.80± 1.89%, respectively (Table 4). Results are in accordance with (Shan et al.,2005). Data indicate that oregnao bread had an increase of phenolics amount of approximately three-time compared to the quantity contained in the control. Results of radical scavenging activity are consistent with those obtained from measurement of total phenolics. Similar results were reported by (Kim et al., 2012)

Storage Study.

Breads prepared with best 2% oregano were packed in LDPE and stored at ambient temperature and checked for visible mold growth on daily basis. Effect of incorporation oregano in bread on visual mold growth is given in Table 5. Control bread which contained no preservative spoiled within three days. No. Oregano bread had a shelf life of 6 days. Inhibitory action of oregano against bakery mold was reported by (Gordana et al., 2009; Kocic-Tanackov et al., 2012; Omidbeygiet al., 2007).

Conclusion

Water absorption and dough development time increased by adding oregano. Dough stability decreased as level of oregano increased in the blend. Oregano showed a decrease in mixing tolerance index as the levels of oregano increased in flour. Addition of oregano at 1-4% changed the bread-making performances. An increased baking absorption and specific volume observed for oregano bread than control. Oregano bread had no significant effect on the texture of bread. Results of sensory analysis suggested that addition of oregano in bread formula up to 2 % level of incorporation did not interfere in bread acceptability. Oregano bread was awarded more scores than control. Incorporation of oregano markedly increased the total phenol content and the radical scavenging activity of bread. Oregano bread had a shelf life of 6 days at room temperature. Therefore oregano could be regarded as a potential health-promoting functional ingredient.

References

[1]. Aliani M., Ryland D., Pierce G.N. (2012) Effect of flax addition on the flavor profile and acceptability of bagels. J Food Sci 77:S62-70. DOI: 10.1111/j.1750-3841.2011.02509.x.

[2]. Amarowicz R., Żegarska Z., Rafałowski R., Pegg R.B., Karamać M., Kosińska A. (2009) Antioxidant activity and free radical-scavenging capacity of ethanolic extracts of thyme, oregano, and marjoram. European Journal of Lipid Science and Technology 111:1111-1117. DOI: 10.1002/ejlt.200800170.

[3]. Burt S. (2004) Essential oils: their antibacterial properties and potential applications in foods—a review. International Journal of Food Microbiology 94:223-253. DOI: 10.1016/j.ijfoodmicro.2004.03.022.

[4]. Chen H., Rubenthaler G.L., Leung H.K., Baranowski J.D. (1988) Chemical, Physical, and Baking Properties of Apple Fiber Compared with Wheat and Oat Bran. Cereal Chemistry 65:244-47.

[5]. Chen M.-F. (2011) The mediating role of subjective health complaints on willingness to use selected functional foods. Food Quality and Preference 22:110-118. DOI: 10.1016/j.foodqual. 2010.08.006.

[6]. Chun S.-S., Vattem D.A., Lin Y.-T., Shetty K. (2005) Phenolic antioxidants from clonal oregano (Origanum vulgare) with antimicrobial activity against Helicobacter pylori. Process Biochemistry 40:809-816. DOI: 10.1016/j.procbio.2004.02.018.

[7]. Davidson M., Juneja V.K. (1994) Antimicrobial Agent, in: A. L. Branen, et al. (Eds.), Food Additives, Marcel Dekker Inc,, New York,, USA. pp. Pp 83-137.

[8]. Gordana R.D., Sunčica D.K., Dušanka J.P., Jelena D.P., Ilija J.T., Danijela T. (2009) Antimicrobial activity of caraway, garlic and oregano extracts against filamentous moulds. BIBLID 40:9-16.

[9]. Govaris A., Botsoglou E., Sergelidis D., Chatzopoulou P.S. (2011) Antibacterial activity of oregano and thyme essential oils against Listeria monocytogenes and Escherichia coli O157:H7 in feta cheese packaged under modified atmosphere. LWT - Food Science and Technology 44:1240-1244. DOI: 10.1016/j. lwt.2010.09.022.

[10]. Grieve M. (1994) A Modern Herbal. London,,Tiger:519–21.

[11]. Hayta M., Gamze Ö. (2011) Chapter 27 - Phytochemical Fortification of Flour and Bread, in: P. Victor, et al. (Eds.), Flour and Breads and their Fortification in Health and Disease Prevention, Academic Press, San Diego. pp. 293-300.

[12]. Holland B., Unwin I., Buss D. (1991) The Composition of Foods: Vegetables, Herbs and Spices Bath McCance Widdowson's.

[13]. Ivanovski B., Seetharaman K., Duizer L.M. (2012) Development of soy-based bread with acceptable sensory properties. J Food Sci 77:S71-6. DOI: 10.1111/j.1750-3841.2011.02510.x.

[14]. Kim I.S., Yang M., Goo T.H., Jo C., Ahn D.U., Park J.H., Lee O.H., Kang S.N. (2012) Radical scavenging-linked antioxidant activities of commonly used herbs and spices in Korea. Int J Food Sci Nutr 63:603-9. DOI: 10.3109/09637486.2011.641942.

[15]. Kocić-Tanackov S., Dimić G., Tanackov I., Pejin D., Mojović L., Pejin J. (2012) The inhibitory effect of oregano extract on the growth of Aspergillus spp. and on sterigmatocystin biosynthesis. LWT - Food Science and Technology 49:14-20.DOI: 10.1016/j.lwt.2012.04.013.

[16]. Mendis E., Kim S.-K. (2011) Chapter 1 - Present and Future Prospects of Seaweeds in Developing Functional Foods, in: K. Se-Kwon (Ed.), Advances in Food and Nutrition Research, Academic Press. pp. 1-15.

[17]. Nevas M., Korhonen A., Lindstrom M., Turkki P., Korkeala H. (2004) Antibacterial efficiency of Finnish spice essential oils against pathogenic and spoilage bacteria. Journal of Food Protection 67:199-202.

[18]. Noort M.W.J., van Haaster D., Hemery Y., Schols H.A., Hamer R.J. (2010) The effect of particle size of wheat bran fractions on bread quality – Evidence for fibre–protein interactions. Journal of Cereal Science 52:59-64. DOI: 10.1016/j.jcs.2010.03.003.

[19]. Omidbeygi M., Barzegar M., Hamidi Z., Naghdibadi H.(2007) Antifungal activity of thyme, summer savory and clove essential oils against Aspergillus flavus in liquid medium and tomato paste. Food Control 18:1518-1523. DOI: 10.1016/j.foodcont. 2006.12.003.

[20]. Ronda F., Rivero P., Caballero P.A., Quilez J. (2012) High insoluble fibre content increases in vitro starch digestibility in partially baked breads. Int J Food Sci Nutr. DOI:10.3109/09637486.2012.690025.

[21]. Shan B., Cai Y.Z., Sun M., Corke H. (2005) Antioxidant Capacity of 26 Spice Extracts and Characterization of Their Phenolic Constituents. Jour-

nal of Agricultural and Food Chemistry 53:7749-7759. DOI: 10.1021/jf051513y.

[22]. Siró I., Kápolna E., Kápolna B., Lugasi A. (2008) Functional food. Product development, marketing and consumer acceptance—A review. Appetite 51:456-467. DOI: 10.1016/j.appet.2008.05.060.

[23]. Szczesniak A.S. (1963) Classification of Textural Characteristicsa. Journal of Food Science 28:385-389. DOI: 10.1111/j.1365-2621.1963.tb00215.x.

[24]. Szczesniak A.S. (1995) Texture Profile Analysis- Methodology interpretation clarified. Journal Food Science: 60: vii.

[25]. Truong V.D., Hamann D.D., Walter W.M. (1997) Relationship between instrumental and sensory parameters of cooked sweetpotato texture1. Journal of Texture Studies 28:163-185.DOI: 10.1111/j.1745-4603.1997.tb00109.x.

[26]. Marino M, Bersani C, Comi G (2001) Impedance measurements to study the antimicrobial activity of essential oils from Lamiaceae and Compositae. Int J Food Microbiol 67: 187-195.

[27]. Rota MC, Herrera A, Martínez RM, Sotomayor JA, Jordán MJ (2008) Antimicrobial activity and chemical composition of Th ymus vulgaris, Th ymus zygis and Th ymus hyemalis essential oils. Food Control 19: 681-687.

[28]. Sokmen M, Serkedjieva J, Daferera D, Gulluce M, Polissiou M, Tepe B, Akpulat HA, Sahin F, Sokmen A (2004) The in vitro antioxidant, antimicrobial and antiviral activities of the essential oil and various extracts from herbal parts and callus cultures of Origanum acutidens. J Agric Food Chem 52: 3309- 3312.

[29]. Baydar H, Sagdic O, Ozkan G, Karadogan T (2004) Antibacterial activity and composition of essential oils from Origanum, Th ymbra and Satureja species with commercial importance in Turkey. Food Control 15: 169-172.