EFFECT OF VACUUM PASTEURIZATION ON PHYSIOCHEMICAL AND FUNCTIONAL PROPERTIES OF FLAX SEED FLOUR

Flaxseed is often eaten by consumers in cold cereals, shakes, yogurt topping and ice cream. Also, food processors use raw or minimally-treated flaxseed or flax flour in cereals, supplements, protein shakes, energy bars, baked foods, juices, milk and dairy products, pasta products and meat products (Goyal et al, 2014). However, microbial contamination of raw flaxseed may pose a food safety risk to consumers (Vegi et al, 2017). Shah et al (2017) has shown the ability to control microbial contamination by using vacuum steam-pasteurization on several low-moisture foods including flaxseed and milled flaxseed.

In a study conducted by Healthy Food Ingredients (HFI), vacuum pasteurization has achieved a 5-log reduction of Salmonella in flaxseed. Microbiological testing for process validation has been conducted by an ISO/AOAC certified and accredited laboratory.

Some heat processing methods can impact chemical, physical and functional properties of flax flour (Chen et al, 1994; Ekstrand et al, 1993). The objective of this study was to determine the impact of the vacuum pasteurization on physical and functional properties of flax flour. Cleaned, whole flaxseed (Linum usitatissimum) was purchased from three different suppliers, mixed well and subdivided as described below. One sample set was ground without pasteurization into US standard 14- and 30-mesh sizes with an Urschel Comitrol® mill. The other sample set was vacuum pasteurized as whole flaxseed. Following pasteurization, the seeds were cooled to room temperature using liquid nitrogen. Immediately after cooling, samples were ground into US standard 14- and 30-mesh sizes with an Urschel Comitrol mill.

Moisture, water activity, peroxide value, color, flow properties, particle size distribution, bulk density, water absorption and oil absorption were measured on both sample sets after milling. Data indicates HFI's vacuum pasteurization process has little or no significant impact on the physiochemical and functional properties of flax flour, therefore providing critical reduction in microbial risk with negligible impact on the final product.

APPENDIX

Table 1. Chemical properties of flax flour

Sample	**Moisture (%)**	**Water Activity**	**Peroxide Value (mEq/Kg)**
Non- Pasteurized – 14 Mesh	6.16 ± 0.13	0.52 ± 0.00	0.02 ± 0.01
Pasteurized – 14 Mesh	5.47 ±0.11	0.47 ± 0.01	0.19 ± 0.01
Non- Pasteurized – 30 Mesh	6.08 ± 0.10	0.54 ± 0.00	0.07 ± 0.00
Pasteurized – 30 Mesh	5.58 ± 0.29	0.49 ± 0.02	0.23 ± 0.01

Table 2. Color of flax flour

Sample	**Color**		
	L*	**a***	**b***
Non- Pasteurized – 14 Mesh	53.98 ± 0.04	5.35 ± 0.02	13.39 ± 0.05
Pasteurized – 14 Mesh	53.55 ± 0.87	4.56 ± 0.31	15.29 ± 0.45
Non- Pasteurized – 30 Mesh	55.26 ± 0.06	5.04 ± 0.02	13.48 ± 0.03
Pasteurized – 30 Mesh	57.49 ± 1.18	3.96 ±0.15	12.90 ± 0.53

Contact Us
HFIfamily.com or 844-275-3443

Table 3. Flow properties of flax flour

Sample	**Angle of Repose (°)**	**Angle of Slide (°)**	
		Al	**SS**
Non- Pasteurized – 14 Mesh	26.83 ± 0.79	25.33 ± 1.15	34.00 ± 1.73
Pasteurized – 14 Mesh	26.57 ± 0.92	31.67 ±3.51	36.67 ± 4.16
Non- Pasteurized – 30 Mesh	25.33 ± 1.89	39.67 ±0.57	34.33 ± 1.15
Pasteurized – 30 Mesh	27.70 ± 0.72	42.33 ±1.52	37.66 ± 0.57

Al – Aluminum, SS – Stainless steel

Table 4. Functional properties of flax flour

Sample	**Bulk density (g/ml)**		**WAC**	**OAC**
	Loose	**Compact**		
Non- Pasteurized – 14 Mesh	0.40 ± 0.01	0.53 ± 0.01	3.65 ± 0.05	1.15 ± 0.01
Pasteurized – 14 Mesh	0.38 ± 0.01	0.52 ± 0.00	3.75 ± 0.05	1.00 ± 0.01
Non- Pasteurized – 30 Mesh	0.38 ± 0.02	0.53 ± 0.02	3.79 ± 0.06	1.10 ± 0.04
Pasteurized – 30 Mesh	0.37 ± 0.02	0.49 ± 0.01	3.04 ± 0.46	1.16 ± 0.01

WAC-Water absorption capacity, OAC- Oil absorption capacity