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THE EFFECT OF *ALEUROGLYPHUS OVATUS* ON STORED WHEAT BRAN

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Studies on sound and *Aleuroglyphus ovatus* infested wheat bran showed considerable changes in total proteins, lipids, carbohydrate, crude fibre and free amino acids as well as fatty acids besides the remarkable changes in the moisture, ash, and mineral elements content.

Key words: Wheat bran, *Aleuroglyphus ovatus*, Elements, Fatty acids.

INTRODUCTION

Wheat bran has an economic importance because of its use as forage for animal and birds (chickens) as well as in the make up of bread, etc. Previously, Hughes [1] listed that *Aleuroglyphus ovatus* can multiply on wheat bran during storage forming large colonies. So, the changes in the chemical constituents of the infested wheat bran during the storage period in comparison with uninfested sample (control), are described.

MATERIALS AND METHODS

Preparation of samples. One hundred newly emerged adults of *Aleuroglyphus ovatus* (Troupeau) were introduced into a jarfilled to its half with the feeding medium and covered with a piece of linoncloth fixed tightly to the jar's rim. The jars were sterlised at 100° for 24 hrs before use. Wheat bran (control), was kept, in an electrical oven at 90°, for six hrs. to kill any contaminating insects or mite before use Donia *et al* [2]. The dry jars were then kept in a rearing chamber at 25° and 75 % R.H. and in dark. Thus, after three months, numerous different instars of *Aleuroglyphus ovatus* were available for study.

Methods of extraction and analysis. Weighed samples (100 gm each) of uninfested and infested (containing mites) wheat bran were treated separately with chloroform-methanol mixture (2:1 v/v) Rouser *et al.* [3], for one week with occasional shaking, at room temperature, followed by filtration. The clear filtrates were evaporated to dryness under reduced pressure. A sample from each lipid extract was saponified, George *et al.* [4]. The obtained fatty acids were esterified, Jellum [5], followed by examination on Varian-3700 Gas Chromatograph using a column (50 x 0.32 cm) packed with 5 % OV-101, on chromosorb GHP (80-100 mesh) at 160-255°, 6°/min., with flow rates: N_2 20 ml/min, H_2 20 ml/min, and air 200 ml/min. Authentic samples of fatty acids methyl esters were used as standards (Table 1 and 2).

Table 1. Compositions of sound and infested wheat bran (gm % on dry weight)

Compositions	Sound (control)	Infested (with mites)
Lipids	4.084	2.622
Proteins (NaOH-soluble)	22.610	17.007
Carbohydrate (H_2O-soluble)	42.898	64.786
Hemicellulose	2.251	3.980
Crude fibre	23.882	10.010
Ash	4.140	1.488
Free amino acids as glycine	0.071	0.044

The moisutre content of sound and infested samples = 0.92 and 10.63 % respectively.

Table 2. Percentage of the fatty acids methyl esters of sound and infested wheat bran.

Fatty acid	Sound (control)	Infested (with mites)
Caprylic	–	9.50
Capric	23.95	8.04
Stearic	73.43	68.49
Oleic	0.11	12.33
Linolenic	2.05	0.64
Unidentified	0.11	0.09
Unidentified	0.34	0.91

The carbohydrates of sound and infested wheat bran samples were obtained by treating the defatted samples separately with boiled distilled water followed by 4 % NaOH solution, each for one hour, on water bath, Amin and El Deeb [6]. The extracts were acidified with 50 % acetic acid solution, followed by centrifugation and each clear supernatent was poured into ethanol (1:3 v/v) to pre-

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cipitate the carbohydrate fractions. The precipitates were dried separately till constant weight, and weighed, (Table 1).

The crude fibres of both samples of wheat bran were obtained according to David [7], by treating the defatted materials with boiling dilute solutions of sodium hydroxide and HCl, then the residual fibre of each sample was dried till canstant weight and weighed (Table 1).

Another sample from sound and infested wheat bran (10 gm each) were shaken separately with sodium hydroxide solution (100 ml of 0.05 N) for 15 min., followed by centrifugation. The total protein (NaOH-soluble) content of each obtained supernatent was estimated according to Hartree [8], by treating 1 ml of each supernatent with Folin-Ciocalteau reagent, and the developed color was measured colorimeterically at 650 nm, using LKB– Ultraspec II spectrophotometer. Different concentrations of egg albumin solution were used as standards.

Another portions of both samples were ashed, separately till constant weight, and the residual ash was estimated, dissolved in 20 % HCl and subjected to atomic absorption analysis (Table 3).

Table 3. Concentrations of the examined wheat bran elements (ppm).

Wheat bran	Ca	Mg	Cu	Fe	Mn
Sound (control)	240	35	26	135	105
Infested (with mites)	110	14	15	90	55

Two gms from each wheat bran samples were oven-dried separately, at 100°, till constant weight, for the moisture content (Table 1).

The acidity of both samples (20 gm each) was determined according to David [9], using water and petroleum ether extracts. The acidity of water extract was calculated as KH_2PO_4, while that of petroleum ether extract was calculated equivalent to alcoholic solution of sodium hydroxide (0.05 N), (Table 4).

Finally one gm from each sample was shake separately, with ethanol (25 ml of 75 %), for 30 min. and the released free amino acids of each extract were estimated colorimeterically after treating with ninhydrin solution (0.2 % in acetone), with glycine solution (0.06 mg/ml) as standard (Table 1).

Table 4. The acidity of sound and infested wheat bran.

	Sound (control)	Infested (with mites)
Water extract (as KH_2PO_4)	0.429 gm	0.170 gm
Petroleum ether extract (as NaOH, 0.05 N)	4.0 ml	3.3 ml

RESULTS AND DISCUSSION

As reported that considerable changes occuring in stored products, were due to infestation with different species of mites, Saleh *et al* [10,11]. Analysis of sound (control) and infested wheat bran showed changes occur in color (which becomes dirty grey), odour, biochemical components and soiling due to accumulation of the *Aleuroglyphus ovatus.*

Examination of samples of sound and infested wheat bran showed losses in the lipid, protein, crude fibre, ash and free amino acids contents, while there is a slight increase in the moisture and soluble carbohydrate contents of the infested samples. It seems that, *Aleuroglyphus ovatus* cause the hydrolysis of a part of cellulose to soluble low molecular weight carbohydrates (probably by enzymatic action).

In addition, gas liquid chromatographic analysis of the lipid fraction of sound and infested wheat bran, indicated that capric, stearic, oleic and linolenic acids were the main fatty acids in both samples in different concentrations. Caprylic acid was identified only in the infested wheat bran in concentration 9.5 %, while oleic acid increased to about 12.33 %.

Furthermore, there is a loss in the acidity of the infested wheat bran sample for both water and petroleum ether extracts (Table 4).

Also, examination of both samples with regards to the concentration of Ca, Mg, Cu, Fe, and Mn, it was found that in infested samples, these elements decreased to about half of their concentration in sound sample. This is probably, due to the *Aleuroglyphus ovatus* content in the infested sample.

Keeping in view, the economic importance of wheat bran, it is important to prevent the growth of these mites in stored wheat bran in order to preserve its nutritional value.

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