

Biotechnological studies on linc, iron, copper and manganese bioavailability of some cereal products

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partial SIpp1L' III' II[; ltioll will'al flour UII,1 with l1a III:1I hk'IHI ; 11 levels .I,()&I~IIand chemical salts blend. Chemical composition, minerals content, rheological properties, organolyptic evaluation, biological evaluation and hislopahologicd cxnminution were studied. TIII' obtained results weresummarized as follow:1-Chcmical composition of used raw materials : The chemical analysis showed that wheat flour (72%) contained 11.5% moisture, 11% protein, 1.31 %fat, 0.98% fiber, 0.50% ash, 86.21 %carbohydrates and 400.63K.Cal/100g. Defatted soy flour contained 10.71% moisture, 48.61% protein, 5.35% fat, 3.16% fiber, 3.92% ash, 38.96% carbohydrates and 398.43K.Cal/100g. Sesame contained 4.18% moisture, 21.34% protein, 55.12% fat, 5.14% fiber, 3.81 % ash, 14.49% carbohydrates and 639.40K.Cal/100g. Thyme contained 6.32% moisture, 10.21% protein , 6.17% fat, 16.13% fiber, 12.54% ash, 54.65% carbohydrates and 314.97 K.Cal/100g. Cumin contained 7.15% moisture, 18.23% protein, 13.65% fat, 6.19% fiber, 7.24% ash, 54.69% carbohydrates and 414.53%K.Cal 100g. Coriander contained 9.33% moisture, 11.15% protein, 15.39% fat, 23.57% fiber, 4.82% ash, 45.07% carbohydrates and 363.39K.Cal 100g. 2-Minerals content of used raw materials : The results demonstrated that wheat flour (72%) containing from Fe, Zn Cu and Mn were 1.86, 0.98, 0.82 and 0.72mg/ 100g respectively. Defatted soy flour containing from Fe, Zn, Cu and Mn were 9.19 , 5.84, 3.25 and 1.55mg/100g successively. Sesame containing from Fe, Zn, Cu and Mn Were 13.78, 9.52, 1.17 and 1.26mg/100g respectively. Thyme containing from Fe, Zn, Cu and Mn were 122.36, 6.73 , 1.13 and 1.59mg/100g respectively. Cumin containing from Fe, Zn, Cu and Mn were 53.45, 5.57, 1.49 and 1.13mg/100g successively. Coriander containing from Fe, Zn, Cu and Mn were 17.41, 6.19, 1.21 and 0.92mg/100g respectively. 3-Rheological properties: 3.1. Farinograph test : The results declared an increase in water absorption in all blends, this increasing was probably as a result of the higher protein content of the blends causing greater hydration capacity. Arrival time and dough development time increased except for chemical blend no changed. Dough stability decreased in natural blend at levels 3, 6 and 9%. This decrease may be due to the higher fiber content which destroyed the gluten matrix, while chemical blend increased. Dough weakening increased in natural blend at levels 3, 6 and 9% while chemical blend decreased when compared with control. 3.2. Extensograph test: The data mentioned that dough extensibility decreased in all blends. Resistance to extension decreased except for chemical blend increased. This increasing may be to the oxidizing SH-group to S-S bonds. 1~11'.U ; NII t 'ONT 'U ISIONI"rllIII 1)0, .1 ltl 1)~, 21 111f: /dl, 111'1.:1 r:ll1l, 'l'dfl'IIIII[,l" 101:-', 1)01111-' /111 .uu] * ..creatinine ranged from 0.95 to, 0.97 mg/dL 9_Histopathological examination: Liver in anemic control occurred severe congestion and hemolysis. Liver in group No.1 occurred mild to moderate congestion and hemolysis. Liver in group No.2 occurred mild vacular degeneration. Liver in group No.3 occurred hemorrhage and moderate vacular degeneration. Liver in group No.4 occurred congestion, hemorrhage and fatty change. Spleen in anemic control occurred depletion of lymphocytes in the white pulp with hemosiderosis in diffuse manner all over the anemic red pulps. Spleen in group No.1 occurred congestion, hemolysis and hemosiderosis with normal white pulp. Spleen in group No.2 occurred well organized white pulp with slight hemosiderosis. Spleen in group

No.3 and 4 were as normal control. Kidney in anemic control occurred hemorrhage, hemolysis and dilatation in the renal tubules. Kidney in group No.1 occurred moderate congestion and hemolysis. Kidney in group No.2 occurred mild congestion without hemolysis. Kidney in group No.3 occurred mild congestion and hemolysis. Kidney in group No.4 occurred mild hemorrhage without hemolysis and degenerative changes in renal epitheliums. Lung in anemic control occurred severe congestion in peribroncheal and perialveolar blood vessels in association with oedema. Lung in group No.1 occurred perialveolar congestion and emphysema. Lung in group No.2 occurred very slight congestion. Lung in group No.3 was normal. Lung in group No.4 occurred mild congestion in perialveolar capillaries. Heart in anemic control and group No.1 occurred hemorrhage. Heart in group No.2 and 3 were normal cardiac muscle. Heart in group No.4 occurred slight mononuclear cells aggregation, from this investigation it could be concluded that group No.3 of rats which fed on 9% natural blend was the best group concerning blood analysis and histopathological examination. Finally, the minerals intake of population who subsist on wheat flour and other cereals are often low thus, can be applied to extrapolating the finding of the study to human subject, especially in those areas where diets are marginal in nutrients and the major portion of daily caloric intake come from foods of plant origin (100).