STUDIES ON THE EFFECTS OF CHITOSAN ON THE ENROBING AND ABSORPTION ABILITY OF FATS AND CHOLESTEROL

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ABSTRACT

CHITOSAN IS A HIGH MOLECULAR WEIGHT POLYMER WITH SIGNIFICANT PHYSIOLOGY ACTIVITY.IN FOOD AND NUTRITION APPLICATIONS, CHITOSAN CAN DECREASE THE ABSORPTION OF LIPIDS IN VIVO.THE OBJ -ECTIVES OF THE RESEARCH WERE TO STUDY EFFECTS OF CHITOSAN PREPARED FROM CRAB SHELL WITH DIFFERENT DEGREE OF DEACETYLATION (D.D.) AND VARIOUS MOLECULAR WEIGHT (M.W.)ON THE ABSORPT -ION OF LIPIDS IN VIVO.IN A SIMULATING SYSTEM OF HUMAN DIGESTIVE TRACT,INDIVIDUAL CHITOSAN WAS MIXED WITH THREE KINDS OF LIPIDS (INCLUDE SALAD OIL,PORK FAT,AND HYDROGENISED OIL)INDI -VIDUALLY TO FOUND OUT WHAT KINDS OF CHITOSAN CAN ABSORB LARGER AMOUNT OF LIPIDS TO AVOID THE HYDROLYSIS OF THEM BY LIPASE AND BILE SALT. THE BEST CHITOSAN IN OPTIMUM USE DOSAGE WAS THEN APPLIED IN HIGH FAT CONTENT FOOD,FOR EX -AMPLE,FRIED DOUGH STICK AND FRIED SAUSAGE,TO REALIZE ITS FUNCTION IN DECREASING FAT ABSOR -PTION IN VIVO.EFFECT OF THE ADDITION OF CHITOSAN ON FLAVOR AND VOLATILE COMPOSITION AND OVERALL PREFERENCE OF THESE HIGH FAT CONTENT FOOD WAS ALSO STUDIED. TO INVESTIGATE EFFECTS OF CHITOSAN SUPPLEMENT ON THE LIPID METABOLISM IN VIVO,AND THE GR -OWTH OF EXPERIMENTAL ANIMAL,THE BEST CHITOSAN IN DIFFERENT USE DOSAGE WAS THEN APPLIED TO ANIMAL FEEDING TRAIL.IN ANIMAL FEEDING TRIAL,MALE SYRIAN WERE RANDOMLY DIVIDED IN TO THREE GROUPS AND FED WITH SYNTHETIC DIET (AIN-76)CONTAINING DIFFERENT LEVEL OF CHITOSAN,I.E.CONT -ROL(5%CELLULOSE IN DIET),G-1 (0.3 % CHITOSAN,4.7 % CELLULOSE IN DIET),AND G-2(0.7 % CHITO -SAN,4.3 % CELLULOSE IN DIET),INDIVIDUALLY FOR 5 WEEKS. THE M.W. AND D.D. OF CHITOSAN PREPARED FROM CHITIN BY CHEMICAL MODIFICATION AND VARIOUS REACTION TIME WAS FOUND AMOUNG 100-500 KDA AND 75-96 %,INDIVIDUALLY.THE PARTICLE SIZE OF C -HITOSAN PREPARED WAS AROUND 120 MESH.IN SYSTEM OF SIMULATING HUMAN DIGESTIVE TRACT,WHEN THE D.D. WAS THE SAME,THE CHITOSAN HAVING HIGHER M.W. WAS FOUND TO HAVE BETTER FUNCTION IN LIPIDS ABSORPTION AND LESS FREE FATTY ACIDS WILL BE RELEASED.WHEN THE M.W. WAS THE SAME,TH -E CHITOSAN HAVING HIGHER D.D.WAS FOUND TO HAVE BETTER FUNCTION IN LIPIDS ABSORPTION AND L -ESS FREE FATTY ACIDS WILL BE RELEASED.THE CHITOSAN HAVING A M.W. AROUND 490 KDA AND HAVIN -G A D.D. 96 % WAS FOUND TO BE THE BEST ONE IN FAT ABSORPTION.THE LARGEST ABSORPTION AMOUN -T OF LIPIDS FOR ONE GRAM OF CHITOSAN IS 10 ML.ADDITION OF THE CHITOSAN HAVING A M.W.AROUN -D 490 KDA AND A D.D. 96 % IN A USE AMOUNT OF ONE GRAM CHITOSAN PER 10 G FAT TO SAUSAGE AN D FRIED DOUGH STICK DEMONSTRATED THAT CHITOSAN HAD GOOD LIPIDS ABSORPTION ABILITY IN HIGH FAT CONTAINED FOOD. IN THE ANALYSIS OF VOLATILE COMPOUNDS IN FRIED SAUSAGE AND FRIED DOUGH STICK WITH OR WITHOUT CHITOSAN ADDED, IT WAS FOUND THAT AMOUNT OF LIPID OXIDATION VOLATILE PRODUCTS,I.E.2,4-DECADIENEAL AND HEXANAL, WAS LOWER IN FRIED SAUSAGE OR FRIED DOUGH STICK WITH CHITOSAN ADDED THAN THAT WITHOUT CHITOSAN ADDED.THE ADDITION OF CHITOSAN IN FRIED SAU -SAGE OR IN FRIED DOUGH STICK WOULD NOT AFFECT THE OVERALL PREFERENCE OF THESE PRODUCT. IN A FIVE WEEKS' ANIMAL FEEDING TRIAL, THE LEVELS OF TRIGLYCERIDES,NEFA, CHOLESTEROL,LDL-CHOL -ESTEROL AND HDL-CHOLESTEROL IN SERUM AND STOOL LIPID OF THE TESTED SYRIAN WERE DETERMINED THE RESULTS SHOWED THAT NEFA AND CHOLESTEROL IN SERUM OF EXPERIMENTAL ANIMAL DECREASE 10 % AND 15 %, INDIVIDUALLY.THE STOOL LIPID VOLUME OF THE TESTED SYRIAN WITH CHITOSAN SUPPLEMEN -T IN DIET WAS HIGHER THAN THAT WITHOUT CHITOSAN SUPPLEMENT. IN ADDITION,CHITOSAN WAS FOUN -D HAVING NO SIDE EFFECT IN GROWTH OF ANIMALS IN A SUPPLEMENT AMOUNT OF 0.3 % (W/W) OR 0.7 %(W/W).

Keywords : CHITIN, CHITOSAN, LIPIDS, CHOLESTEROL, FATTY ACID, DEACETYLATION, MOLECULAR, SYRIAN

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