

## **4-Evaluation of Mandarin and Navel Orange Peels as Natural Sources of Antioxidant in Biscuit**

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### **Abstract**

The use of navel orange and mandarin peels as natural antioxidant in biscuits production was investigated. Chemical composition of peels showed that peels had high contents of ash, ether extract and crude fiber and low protein content. Navel orange and mandarin peels powder was used in production of hard biscuits (Marie) at three levels of wheat supplementation 5%, 10% and 15%. Sensory evaluation and chemical analysis of biscuits indicated that supplementation with 5% and 10% levels were well accepted in all organoleptic properties compared with the control sample, but at 15% level low scores indicated unacceptable product. Addition of peels powder increased crude fiber; ash and ether extract contents of biscuits. The results indicated that the mandarin and navel orange peel extracts have antioxidant activity. Mandarin peel had the highest total phenols (780mg/100g dry matter) and the highest antioxidant activity. Also, data indicated that the addition of navel orange and mandarin peels powder increased the shelf life of biscuits compared to the control. Addition of peels inhibited lipid oxidation as indicated by the peroxide values of navel orange and mandarin biscuit. The peroxide values after 6 month of storage at 25°C and 40°C were (8.9 and 10.3 meq./kg fat) and (8.2 and 12.5 meq./kg fat) for navel orange and mandarin biscuit respectively compared to control (29.5 and 35 meq./kg fat). Consequently, it could be concluded that navel orange and mandarin peels powder might be use instead of synthetic antioxidants; as the addition of peels at 10% level had no adverse effect on the organoleptic properties of biscuits. Moreover, the biological results indicated that the substitution with peels up to 10 % improved the weight gain of rats, decrease the levels of serum total cholesterol, liver lipid and liver cholesterol and glucose blood. Finally, addition of peels as source of natural antioxidant can be recommended to increase the shelf life of food products containing fats and oils, which is safe and can impart health benefits to the consumer

**Key words:** *mandarin and navel orange peels, antioxidants; chemical composition, biological tests; organoleptic evaluation, biscuits*