EFFECT OF EDIBLE COATINGS ON POSTHARVEST QUALITY OF GREEN BEAN *(Phaseolus vulgaris* L.*)* UNDER COMMERCIAL STORAGE CONDITIONS

By

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B.Sc. Plant Production, Ain Shams University, 2012

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ABSTRACT

SHEREN REDA GAMAL AHMED, Effect of Edible coatings on postharvest quality of green bean under commercial storage conditions. B.Sc., Department of plant production, Faculty of Agriculture, Ain Shams University, 2016.

This work was carried out at the Experimental Farm, Agriculture Faculty, Ain Shams University, Egypt during the two successive seasons of 2013 and 2014, to evaluate the effect of edible coatings on shelf life and postharvest quality of green bean (*Phaseolus vulgaris* L.) during storage. The first experiment, pods treated with edible coatings before storage at the optimum conditions (7°C, 95-98% RH). The second experiment, pods treated with edible coatings before storage at shelf life conditions (14 ºC, 60-70% RH). Edible coating treatments: control, chitosan (1%), casein (2%), ascorbic acid (1%), citric acid (3%) and sucrose (1%) starch (1%) salicylic acid (2mM/l) $CaCl_2$ (1%). Results of this study indicated that in the first experiment, the visual quality were decreased by extending the storage period, regardless of the studied edible coatings and the best visual quality was for $CaCl_2$ (1%), Starch (1%), Sucrose (1%) and Salicylic acid (2mM/l) coatings. Pitting in green bean pods till the middle of storage period during first and second season, pitting was appeared at the last of storage period, where the best coatings were $CaCl_2$ (1%) and sucrose (1%) there is no pitting appeared. Decay of green bean was increased by extending the storage period. Citric acid (3%), chitosan (1%), casein (2%), were the most susceptible for decay during storage since they recorded the highest value of decay compared with the other coatings. Hardness were decreased by extending the storage period, the decreasing in hardness were in the same range for the tested nine edible coatings, whereas there is no significant difference between coatings.

Weight loss percentage increased by extending the storage period during storage at the optimum conditions of green bean. The lowest percentage of weight loss were detected in $CaCl_2$ (1%), starch (1%), sucrose

(1%). Total soluble solids increased in green bean coated with $CaCl_2$ (1%), chitosan (1%), ascorbic acid (1%) respectively stored at the optimum conditions (7°C) during storage for the first season. Coatings with Citric acid (3%) decreased TSS %, but the highest percentage of TSS were for the previous coatings during the second studied season. Chitosan (1%), ascorbic acid (1%) and casein (2%) coatings , record higher content of soluble sugars, but the lowest content recorded for ascorbic acid (1%) and starch (1%) coatings during the first storage season (2013) ,but for the second storage season, casein (2%), sucrose (1%) coatings, and control recorded higher content of soluble sugars and starch (1%), and ascorbic acid (1%) coatings, recorded lower content of soluble sugars. The highest activity of catalase enzyme recorded for ascorbic acid (1%)**,** then salicylic acid (2mM/l) and chitosan (1%) coatings**,** respectively, but the other edible coatings $CaCl_2$ (1%), starch (1%), casein (2%), and control showed moderately activity of catalase enzyme, although the lowest activity of catalase enzyme recorded for citric acid (3%) coating. the previous results recorded under optimum conditions of storage. The best activity for peroxidase enzyme recorded for casein (2%) and chitosan (1%) control, coatings respectively, and the lowest activity recorded for citric acid (3%) coating, and for other treatments $CaCl_2$ (1%) ascorbic acid (1%) and salicylic acid (2mM/l) coatings and control showed moderate activity of peroxidise enzyme. The best activity for ascorbic acid oxidase enzyme was recorded for salicylic acid (2mM/l) and casein (2%) coating, and the lowest activity was recorded for $CaCl_2$ (1%) and chitosan (1%) and the other coatings ; control , ascorbic acid (1%) ,sucrose (1%), citric acid (3%), starch (1%) showing moderate activity of ascorbic acid oxidase enzyme.

Key words: Common bean, *Phaseolus vulgaris*, Edible coating, Physical characters, Chemical analysis, Enzyme activity, Shelf life.

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1. INTRODUCTION

The common Snap bean or ***Phaseolus vulgaris L***. is the most important food legume for direct consumption in the world and the area cultivated annually in Egypt about 78,000 acres**. (Ministry of Agriculture, 2011)**. Among major food crops, it has one of the highest levels of variation in growth habit, seed characteristics (size, shape, and color), maturity, and adaptation. It also has a tremendous variability (> 40,000 varieties). It is produced in a range of crop systems and environments in regions as diverse as Latin America, Africa, the Middle East, China, Europe, the United States, and Canada. The leading bean producer and consumer is Latin America, where beans are a traditional, significant food, especially in Brazil, Mexico, the Andean Zone, Central America, and the Caribbean. In Africa beans are grown mainly for subsistence, where the Great Lakes region has the highest per capita consumption in the world. Beans are a major source of dietary protein in Kenya, Tanzania, Malawi, Uganda, and Zambia. In Asia dry beans are generally less important than other legumes, but exports are increasing from China **(Peters, 1993)**, **Wortmann and Allen**. **(1994).** Beans are a nearly "perfect" food. Nutritionally rich, they are also a good source of protein, folic acid, dietary fiber and complex carbohydrates. Further, when beans are part of the normal diet, the use of maize and rice proteins increases since the amino acids are complementary. Beans are also one of the best non-meat sources of iron, providing (23 %-30 %) of daily recommended levels (**Pachico, 1993)** from a single serving. Consumption of beans is high mostly because they are a relatively inexpensive food. For the poor of the world, they are a means of keeping malnutrition at bay **(WMO, 1992)**. Any advances in scientific research that benefit bean yields, particularly in developing countries, help to feed the hungry and give hope for the future.

Quality loss is not only an important subject from the marketability point of view, but is also a public health concern, as the nutritional value decreases during frozen storage and distribution. The shelf life of frozen