POTENTIAL OF GAMMA-IRRADIATION IN INCREASING THE PECTIN YIELD FROM MANGO (MANGIFERA INDICA) PEELS

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ABSTRACT

The aim of this novel study is to find out if gamma-irradiation can increase the pectin yield of dried mango (carabao variety) peels once exposed to different doses as compared to non-irradiated mango peels. At the same time the utilization of mango peels as a source of pectin can harness the bioeconomy of this agricultural waste.

The samples were prepared from four sets of ripe mango at 1 kilogram per set. Results showed that the dried mango peel of non-irradiated mango is 40 grams and 2 grams of pectin was extracted (5% yield). The next set was irradiated by 1 kGy (kiloGrey) and the 20 grams peel resulted to 2 grams of pectin (10% yield). When 25 grams of peel was exposed to 2 kGy, it gave 2.5 grams of pectin (10% yield). The highest weight of pectin was recorded when 25 grams of peel was exposed to 3.0 kGy that yielded 2.9 grams of pectin (11.6% yield).

This study proved that exposing the mango to a certain dose of radiation, the pectin content of its dried peels can be significantly higher as compared to non-irradiated peels thus, can be an alternative to apple and citrus fruits as source of pectin. The result of this study has the potential to reduce and utilize such agricultural waste that can make mango exporting countries self-sufficient with respect to their pectin needs and can translate into significant dollar savings and create more jobs.

Keywords: *bio-economy, carabao mango peel, gamma-irradiation, kiloGrey, pectin*

INTRODUCTION

Pectin is a fiber found in ripe fruits. It is a gelatinous polysaccharide with a wide range of uses in the food and medical industry. It can lower cholesterol, triglycerides and can prevent colon cancer and prostate cancer. It is also use to treat diabetes and gastroesophageal reflux disease. It can also nourish the skin due to the vitamins and antioxidants present in apple and citrus fruits. Heavy metal poisoning can also be prevented by using pectin. In the food industry, pectin is being used as a thickening agent in cooking and baking and can also be an ingredient in the manufacture of denture adhesives. Furthermore, pectin also binds substances in the intestine that can add bulk to the stools and help prevent constipation.

The common sources of pectin are apple and citrus fruits. Recent research showed that the peel of ripe mango also contain pectin. This study would like to find out if the concentration of pectin in mango peel will increase if exposed to different doses of radiation. The amount of pectin extracted from irradiated mango peels can then be compared to the pectin content of non-irradiated mango peel. The percentage yield of both group of samples can then be determined if significant enough. Usually irradiating fruits can delay its ripening, protect it from insects and is part of phytosanitary requirements of countries importing tropical fruits. This kind of irradiation study is quite novel and little or no researches have been done.

Philippines being a tropical country is a major producer and exporter of mangoes and it imports 100% of its pectin requirements. Many mango products can be produced like dried mangoes, mango ice cream and floats, mango jelly and jam and as desert. In the process tons of peels are being produced and its disposal is a big problem. Thus, this study also aims to maximize the use of this agricultural waste and reduce its accumulation in the environment at the same time generate more employment and save dollars.

Methods

Preparation of Plant samples

Four mango peel samples labelled 0kgy, 1kgy, 2kgy and 3kgy were weighed and oven dried at 60 C for 18 hours. The dried mango peels (40g, 20g, 25g and 25g, respectively) were pulverized using Wiley Mill.

Extraction of Pectin

Sample 0kgy (40g) was added to 400mL of 2% aqueous HCl solution and heated at 70C for 30 minutes. The mixture was filtered using cheese cloth and the filtrate was transferred to a clean container. The residue was added to 200mL of 2% aqueous HCl solution, heated at 70C for 30 minutes (second extraction) and filtered. The combine filtrates (500mL) were precipitated using 1L 95% ethanol overnight. The precipitate was filtered and washed twice with 500mL of 95% ethanol. The precipitated pectin was oven dried at 60C for 2 hours.

The above extraction procedures were also used for sample 1kgy (20g), 2kgy (25g) and 3kgy (25g)

Conclusion and Findings, Scientific Significance

The result showed that the irradiated mango peels have higher pectin content as compared to the non-irradiated mango peel. This shows that irradiation can increase the pectin content of mango peels and this result is very promising to the production of pectin where raw materials can be locally sourced. The non-irradiated mango peel pectin content is 2 grams from a 40-gram sample (5%), while the sample that received 1kgy dose also yields 2 grams from a 20-gram sample (10%). The pectin content of the second sample that received a dose of 2kgy is 2.5 grams from a 25 gram sample (10%). Finally, the third sample which received a dose of 3kgy yielded 2.9 grams of pectin from a 25-gram sample of mango peel (11.9%).

This shows that probably the dose of 3kgy received by mango peel can maximize the percent yield of pectin. This result can be very significant to mango exporting countries that imports 100% of their pectin requirements like the Philippines. Similar study can be done to the common sources of pectin like apples and citrus fruits. This study can boost pectin production that will be a boon to the pectin producing countries and mango growers around the world. It can generate more employments; maximize the use of these agricultural wastes, and save millions of dollars in return.

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