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Jute and kenaf carrier bags: an eco-friendly alternative to plastic bags in India

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Abstract

Increasing demand for shopping and packaging carrier bags has given rise to various issues relating to its disposal as well as to the overall environmental footprint and sustainability of the packaging materials. This study assesses the carbon footprint and life cycle environmental impacts of the production, usage, and disposal of low density polyethylene (LDPE) and two natural fibre carrier bags (jute and kenaf). Life cycle assessment study was conducted of all inputs and outputs, aggregated in the form of resources used and environmental emissions, extending from the production of raw materials to the final disposal of the product. The carbon footprint and GHG emissions of jute and kenaf carrier bags were estimated using the CO_2, N_2O, and CH_4 emissions coefficients of inputs. Research literature from life cycle impact assessment (LCIA) results was used to determine the effects of LDPE polyethylene packaging material. It was observed that the global warming potential (GWP) for the production of 1 kg of LDPE (100 micron) carrier bag (39.4 kg CO_2eq) is more than 490 times higher than jute and kenaf carrier bags. In general, LDPE materials have the greatest impact on the carbon footprint and resource depletion. The LDPE material also has the highest impacts on indicators of terrestrial ecotoxicity, photochemical oxidation, acidification, and eutrophication as compared to jute and kenaf fibres. Since jute and kenaf are natural fibres, they sequester a substantial quantity of carbon during their agricultural stages. As a result, greenhouse gas (GHG) emission emissions of jute and kenaf were found to be negative. Popularising the use of jute and kenaf products as alternatives to plastic in industrialised countries would benefit the reduction of plastic waste and its negative environmental effects. Additional production of jute and kenaf fibre, which are already available in major bast fibre producing countries like India and Bangladesh, could meet the demand for fibre-based carrier bags.

Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Arvind Kumar Singh: conceptualization; investigation; methodology; mathematical analysis; validation; writing—original draft; Shamna Aboo: data curation; writing—review and editing; Tinku Goswami: formal analysis; data curation; Gouranga Kar: project administration, writing—review and editing.

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Ethics declarations

Ethics approval and consent to participate

We all declare that manuscript reporting studies do not involve any human participants, human data, or human tissue. So it is not applicable.

Consent for publication

Our manuscript does not contain any data from any individual person, so it is “not applicable”.

Competing interests

The authors declare no competing interests.

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