

Sustainable Utilization of Agricultural Residues from Fruit Shrubs: Energy Potential and Physical-Chemical Properties

Grigore MARIAN¹, Alexandru BANARI^{1,*},
Teodor MARIAN²

¹Technical University of Moldova, 168 Ștefan cel Mare Blvd., Chisinau, Republic of Moldova

²CC „BASADORO AGROTEH” LLC, Republic of Moldova, PhD student TUM

*alexandru.banari@sfc.utm.md

Abstract. The energy crisis, population growth, and rising living standards exert significant pressure on energy resources and the environment in the Republic of Moldova. In this context, the utilization of agricultural residues, which are abundantly available in rural areas, for renewable energy production from biomass gains increasing importance. This study aims to evaluate the sustainable potential of residues generated by fruit-bearing shrubs, a crop that is expanding in the Republic of Moldova. The physical and chemical properties of biomass derived from the most widespread fruit shrub species cultivated in the country—raspberry, blackberry, gooseberry, currant, blueberry, and sea buckthorn—were analyzed. For these species, the sustainable energy potential and the prospects of using biomass as a raw material for producing densified solid biofuels have been determined. Proximate and ultimate analyses of biomass samples were conducted using standardized and validated methods at the Scientific Laboratory of Solid Biofuels of the Technical University of Moldova. The obtained data indicate that the highest sustainable energy potential is recorded for blackberry biomass (54.78 ± 4.48 GJ/ha), followed by sea buckthorn (42.20 ± 1.37 GJ/ha) and raspberry (40.59 ± 3.79 GJ/ha). The lowest values were recorded for gooseberry and currant biomass, influenced by both lower biomass yields per hectare and lower calorific values.

Keywords: biomass, fruit-bearing shrubs, sustainable energy potential, calorific value.

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