

Article

Evaluation of Agricultural Residues as Organic Green Energy Source Based on Seabuckthorn, Blackberry, and Straw Blends

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Abstract: The use of biomass mixtures as a feedstock in the production of pellets requires optimization of the percentages of the components, since interactions occur during combustion between the components forming the blend (lignin, cellulose, and hemicellulose), affecting characteristics of pellets such as calorific value, ash content, fine fraction content, bulk density, and mechanical durability. Our study focuses on the assessment of the quality of pellets produced from biomass blends generated from pruning seabuckthorn and blackberry mixed with wheat straw. The results of literature data analysis and laboratory research show that wheat straw pellets exhibited the lowest calorific value (15.2 ± 0.2 MJ/Kg) and the highest ash content ($5.7 \pm 0.18\%$) while seabuckthorn and blackberry biomass pellets possessed significantly higher calorific value with low ash content. According to the maximization of the mixtures taken in the study, it was proved that the addition of up to 25% wheat straw remaining seabuckthorn biomass provides all the qualitative indicators specified by ENPlus 3 standards. The straw content can be increased up to 35% if 10–20% of blackberry biomass is added to the mixture. The production of pellets from biomass mixtures with an optimized composition, meeting the requirements of EN3Plus standards, will benefit the environment and the agricultural economy by replacing polluting fuels and making optimal use of straw and fruit tree pruning residues.

Keywords: agronomy; biomass blends; pellets; fruit bushes; seabuckthorn; blackberry; wheat straw



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1. Introduction

The agricultural sector is one of the pillars of the Moldovan and Romanian economy, resulting in a huge amount of residues that are often not valued at their fair value. One of the future directions of valorization of agricultural residues is their use as feedstock for the production of densified solid biofuels, the application for energy purposes being intensively studied in the literature, both worldwide [1–4] and in Moldova and Romania [5–10]. It is also known that only a part of agricultural residues can be used as feedstock for the production of densified solid biofuels with quality characteristics that meet the requirements of ENPlus 3 standards.

Research carried out in the Solid Biofuels Laboratory of the Agrarian State University of Moldova on the energy potential of agricultural residues specific to the Northern Zone of the Republic of Moldova has shown that only 9–10% of the total agricultural residues in this area ensure the quality parameters of the finished product in accordance with the requirements of classes A1 and A2 [11], the other residues being used as a filler in a mixture with other types of biomass [6,12]. Agricultural residues have a low calorific value per

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