Some current pineapple waste utilization aspects

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Abstract. The present paper aimed to briefly review some current aspects regarding the research trends of pineapple waste utilization. Information from new scientific publications was used, systematized and summarized, using the descriptive approach. In the scientific literature, emphasis is placed on the possibilities of circular application of integrated approaches for the valorization of pineapple waste in order to achieve sustainability. Promoting the development of the circular economy and achieving sustainable development are the established emphases in the developments used in this paper. Reducing the total amount of generated waste, limiting the harmful impact on the environment to a minimum, ensuring the safety of users are present as main points both in the current publications, and are emerging as guidelines and directions for future research. The selection and application of appropriate methods for the valorization of pineapple waste is of utmost importance to achieve the sustainable circular goals and principles, respecting and adhering to the ecological trends and aspects in the established and dynamically developing areas of modern integrated and complex management strategies of waste.

1 Introduction

The directions of work in the field of utilization and valorization of pineapple waste are closely related to the integrated modern concepts of circular management of fruit waste in order to achieve sustainability. In modern complex and integrated waste management strategies, including the proper treatment of pineapple waste, priority is given to following environmental trends to achieve basic sustainable principles and circular goals, among which the reduction of the total amount of waste generated, its proper disposal and valorization in order to add value, protect the environment, ensure the safety of users [1 – 9].

The present paper aims to provide a brief overview of some current aspects related to research trends for the utilization of pineapple waste.

2 Materials and methods

The author would like to emphasize that the scientific publications selected and cited here were not intended to be a bibliographic summary of all available and accessible information in the specialized literature. The descriptive approach was used for the preparation of this paper; a search was performed using the keywords "pineapple waste" only in Scopus. At the discretion of the author, only articles containing the term "waste/waste" in their title were selected; conference proceedings as well as book chapters remain outside the scope of this paper. With an extended and updated study, the range of references used could be expanded.

3 Results and discussion

After the research done, the author considers it appropriate to systematize the articles used here depending on the presence of basic terms in their titles as well as the term "waste/waste" among the keywords (Table 1).

Table 1. Systematization of the publications regarding to pineapple waste utilization cited in this paper by presence of main terms.

Main terms	Reference
terms "waste/wastes" presented as a keyword	[1 – 6, 8, 9, 17 – 26]
"peel/peels" in the title	[10, 11, 15 – 17]
"utilization" in the title	[4]
"valorization" in the title	[1, 3, 6, 7, 10, 16 – 18, 25]
"sustainable" in the title	[4, 10, 12, 14]
"by-product/by-products" in the title	[1, 8]

The author believes that the terms listed in Table 1 are most closely related to the problem at hand, and that is why he has chosen them to group the references.

The studies cited in this paper regarding the possibilities for the utilization of pineapple waste are related to: bioactive compounds production [12]; polyhydroxyalkanoates production [10]; antimicrobial polyphenols production [13]; antioxidant compounds

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production [14]; poly 3-hydroxyabutyrate production [25]; fungal pigment production [16]; bio-active compounds and protein extraction [17]; bromelain, ethanol, and xylitol production [19]; bromelain extraction and characterization [18]; 2,5-furandicarboxylic acid synthesis [21]; starch properties determination [24]; vinegar-like beverage production [15]; power generation [22]; pineapple waste silage [20]; anaerobic co-digestion of pineapple wastes with livestock wastes [23]; anaerobic co-digestion of pineapple peel waste and slaughterhouse wastewater [11]; pineapple waste as carbon source [26].

As the current paper aims to present only a momentary general framework of the research trends related to the utilization possibilities of pineapple waste, the author does not consider it appropriate to present, compare and comment on quantitative data from the scientific publications cited here. Such comparison and interpretation in a systematized form of published scientific data, summaries and conclusions available and accessible in the scientific literature, the author believes that it would be more appropriate to advocate them in an extended updated review, rather than in a brief review, emphasizing the latest research on the mentioned issue.

4 Conclusions

As a result of the conducted literature survey, it can be concluded that intensive research is being carried out regarding the search for ways to efficiently utilize pineapple waste (such as isolation and characterization of bioactive compounds, composting, anaerobic digestion, etc.). Adhering to the circular principles and following the modern sustainability trends are among the main emphases in the directions for successful pineapple waste management.

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